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VOCATIONAL PSYCHOLOGY
AND CHARACTER ANALYSIS

By HARRY L. HOLLINGWORTH

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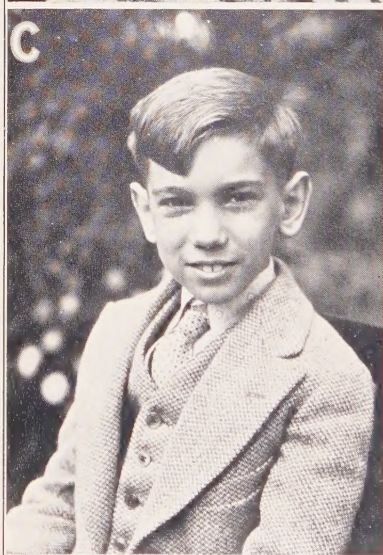
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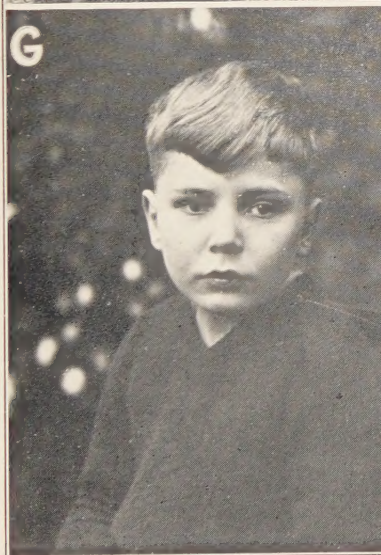
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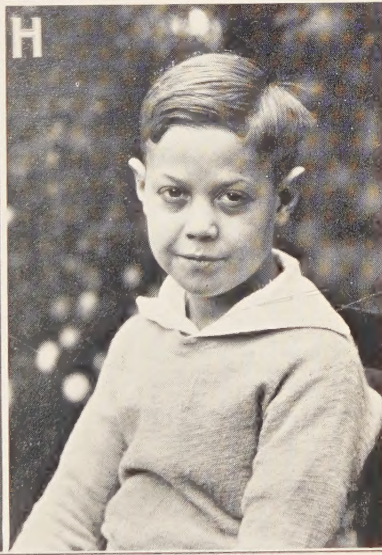
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VOCATIONAL PSYCHOLOGY AND CHARACTER ANALYSIS

BY

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"MENTAL GROWTH AND DECLINE,"
"PSYCHOLOGY, ITS FACTS AND PRINCIPLES," ETC.



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PREFACE

The first edition of *Vocational Psychology* appeared in 1916. Its reception has indicated that it filled usefully a place in the literature of a subject just then beginning to receive serious scientific attention. The field of vocational psychology, under various names, such as vocational guidance, employment psychology, personnel procedure, human engineering, developed rapidly and soon outran the rather cautious predictions of the earlier edition of this book.

In 1922, under the title *Judging Human Character*, a supplementary volume was published, which surveyed some of the more recent developments, especially those concerned with the methods of appraising personal traits and qualities. Traditional methods were criticised and improvements suggested in the technique of applying and interpreting them. An endeavor was also made to communicate a general understanding of the principles underlying the methods of mental measurement.

Separate volumes are now required merely to list the bibliography of this large field of vocational psychology. The general subject has indeed divided into several special enterprises, each of which has experienced substantial growth. The first edition aspired, within its narrow limits, to discuss mental measurement and to give illustrative tests and norms; to consider the formulable principles of vocational guidance; and to outline possibilities in the use of psychological methods in the selection and placement of workers. Each of these fields now has its detailed manuals and handbooks for the use of specialists or advanced students.

It seems, however, still desirable to have a general volume which surveys the whole field of vocational psychology. Such a book finds a place in the introduction of students to the more special topics; it may give a valuable and integrated picture of the relations of these special fields to students, to teachers, to employers and executives. It is also more likely to be intelligible and provocative to the general reader, to that wide public which is in the long run responsible for the continued encouragement of scientific endeavor.

Hence this revised edition, which not only combines the materials of the two earlier volumes, but seeks also to incorporate, in survey fashion, the more recent developments in the field of vocational psychology. Several entirely new topics have also been introduced, in the form of added chapters. Bibliographies are provided, in topical form, so that readers particularly interested in any of the special fields may be guided in their further study.

H. L. H.

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VOCATIONAL PSYCHOLOGY
AND CHARACTER ANALYSIS

It is our business to make both a science and an art of human nature. As in the physical world we select first the material suited to our purpose, then turn the iron into steel and temper the steel for the knife, so in the world of human action we must learn to select the right man, to educate him and to fit him for his exact task. This indeed we try to do in all our social institutions, religions, commerce, systems of education and government. But we work by the rule of thumb—blind, deaf and wasteful. The nineteenth century witnessed an extraordinary increase in our knowledge of the material world and in our power to make it subservient to our ends: the twentieth century will probably witness a corresponding increase in our knowledge of human nature and in our power to use it for our welfare.—J. McKEEN CATTELL, "Homo Scientificus Americanus," Science, April 10, 1903.

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VOCATIONAL PSYCHOLOGY AND CHARACTER ANALYSIS

CHAPTER I

THE PSYCHOLOGY OF A VOCATION

A vocation is much more than a means of earning a living. Work has its economic aspect, to be sure, but even people who do not need to work are often noted for their activity. A vocation has many features, among which we may indicate the economic, the humanitarian, the esthetic, and the mental hygiene aspects. Some of these have a special importance for vocational psychology.

ECONOMIC ASPECTS

The *economic* feature need not detain us long. It is no new discovery that man must live by labor. Even labor-saving machines are laboriously constructed and maintained. But the conviction is more recent that labor or energy should be conserved, and utilized to the best advantage. In the interests of this ideal it is desirable that each individual's occupation be that in which his own peculiar abilities and interests may be the most productive. A higher level of accomplishment for each means a higher standard of living for all. This implies some sort of fitting together of people and jobs. One of the hopes of vocational psychology is that through its endeavors some progress may be made in assisting each individual to attain the

greatest happiness and prosperity that his talents can be made to yield.

It is a deplorable economic waste for individuals to be poorly suited to their work, for them to be unduly slow in finding congenial and profitable employment, for them to be perpetually changing their occupations. The worker unsuited to his work wastes the effort of his teachers, his managers, his fellow workmen. He wastes materials and tools, offends clients, customers, and patrons, and may easily be responsible for industrial accident. Not the least of all, he wastes his own time and energy and loses the cumulative effects of progressive occupation in a single direction. Grave social distress and criminal behavior may even result from the unsuitability of workers to their tasks, and the subtle mental effects which such a situation may engender.

The economic aspect of vocational psychology hinges on the important fact that human beings are neither free, equal, nor alike. Instead, they exhibit through heredity, through early training, through accident, through social pressure, and through personal preference, a great diversity of talents and defects. The ultimate problem of vocational psychology is that of fitting as many as possible of these diversities to the equally diverse requirements of the world's work.

It is clear that this involves at least three major projects. One is that of so analyzing vocational activities that their specific requirements, in terms of human aptitude, may be known. Another is the identification and measurement of the repertory of human faculty, and the diagnosis of aptitude in the case of individuals. The third project is that of providing some technique or machinery

of education, information, advice, and selection so that advantage may be taken of the results of these two achievements. As this volume will testify, all of these projects are now in their early stages.

HUMANITARIAN FEATURES

For our special purpose but few words need be given to the *humanitarian* aspects of work. Strictly speaking, a vocation is not only an occupation, but also a "calling." In some cases this has implied a special mission of service to mankind, at the direction of higher than human agency. In other cases it means a strong passion for certain types of activity, and the profound conviction that the usefulness of the individual, as well as his satisfaction, will be greater if a given kind of work is attempted. On a simpler level the "call" may mean only the desire to do work that urgently needs to be done, work in which the individual's life will count for the most, not in terms of economic success but in terms of human welfare. It seems reasonable to suppose that whatever the nature of the incentive, the humanitarian interest in work can make good use of anything that may be accomplished by the three major projects of vocational psychology.

THE ESTHETICS OF WORK

The third feature of a vocation is its *esthetic* aspect. It is no profound paradox that men and women may work in the spirit of play. Esthetic products, such as music, sculpture, gardens, and literature, are produced through labor, often through arduous toil. Even in the absence of economic and humanitarian motives, men and women may work "for fun." Many of the world's greatest geniuses

have been diligent workers at things they did not need to do to earn their living.

But individuals differ even more in some of their artistic capacities than they do in fitness for the tasks of business, industry, and the professions. And many of the arts require, for their performance, very special talents and interests. Even from an esthetic point of view energy may be lost and pleasure forfeited by playing the wrong game. Not every boy or girl is musically endowed; few can write or paint interestingly, or swim, dance, sing, fish, or play polo with merit. The choice of an avocation can profitably follow the same principles as the adoption of a vocation. The game proceeds with greater gusto when it is suited to the talent and temperament of the player. Vocational and vacational activities are not as unrelated as they sometimes seem.

MENTAL HYGIENE

Most definitely psychological is the relation of work to *mental hygiene*. By this we mean the bearing of a vocation on the mental health of the worker. So significant is this relation that it might well be the subject of a whole volume. We can here but indicate a few of the more important points.

The mentally healthy human being has a well-organized and balanced "self." By this we mean that his activities and interests have some sort of unified organization, are integrated into an effective and stable system. One is not "born with" a self, as he is with eyes and hands. Instead, the self is in large part *achieved* through the activities of life. Even the nervous system, although it has a rough functional organization at birth, acquires its most im-

pressive unity through habit formation and the technique of learning. Each individual must build a self, or else remain the poorly integrated and loosely organized creature he appears in infancy.

There are many agencies that contribute to the building of an organized self. One of the most effective is what may be called the goal, task, or project. An organism is never so solidly organized into a unified system as when it is striving for a particular goal or destination. Indeed it may even be said that the unity is not in the organism but in the singleness of the goal. Sense organs, nerves, muscles, all the bodily systems, and all the individual's knowledge, memories and powers are then under the direction of the same set of stimuli. Their concerted action is what we mean by the integrity of the self. Such a hierarchy of organization constitutes an individual.

On the other hand, no better picture of disintegration of personality can be found than in the case of an organism struggling in several directions at one and the same time. Multiplicity of goals or indefiniteness of aim means a disorganized creature. A vocation, with its progressive development, its circumscription of activity, its definiteness of aim and its purposive plan, aptly serves this rôle of organizing goal in human life. It constitutes a unitary system in which the life of the individual finds its own development, and about which the training, activities, hopes, and memories of the individual may center. For such reasons we may say that every human being needs a vocation, since, though other things may serve, nothing is better calculated than the life plan of a vocation to organize resources and endeavors into an effective and balanced self or system.

The power of a vocation to maintain the integrity of the self is strikingly shown by the frequent rapid collapse of those who have lost their life work by reason of accident, disease, old age, or the mistaken use of prosperity. The "nervous housewife" is, in a surprising number of cases, a woman whose children have grown and left the home for their own careers. The mother, thus deprived of what has for so long been her chief center of self-organization, may now, unless other circumstances are very favorable, exhibit that disintegration of self-organization known as a "nervous breakdown." Those charged with the care of nervous invalids and with the insane and neurotic have long realized the value of occupational therapy in the relief and restoration of diseased selves. Occupational therapy indeed has many sorts of usefulness. In its diversional aspects, as sustained activity directed toward external and impersonal objectives, it diverts attention from minor and fancied ills and occupies the patient with healthy and balancing projects. In its more specific forms it may be so prescribed as to have remedial effect, through exercise, on the patient's particular ailments and disabilities. But most important of all is its self-organizing reaction upon the personality of the patient. It serves to give aim, direction, and system to activities otherwise scattered, incoherent, and antagonistic.

THE SATISFACTORY VOCATION

For vocational activity to have these balancing and organizing influences the activity must satisfy several important criteria. It will be seen that the meeting of these requirements leads at once to just those problems which we have characterized as the major projects of

vocational psychology. Among other considerations the following may be noted:

(a) The occupation should be adapted to the individual's level of general mental ability (as well as to his physical power and endurance). It should be neither too difficult nor too easy for his particular intellectual energies. Work that is too difficult discourages endeavor, evokes feelings of irritation, shame, and inferiority, and produces a chronic baffled and thwarted emotional condition. Not only is chronic thwarting prejudicial to organized self-development; its immediate effects on the health, both of mind and body, are detrimental. Work that is always below the worker's capacity for achievement is equally bad for mental health. It results in boredom, apathy, resentment, feelings of futility, distraction by competing temptations. It fails to contribute that directive organization which balanced self-development requires.

From these considerations it follows that the ideal vocation for a given individual will be one which will be within his range of capacity; will afford him an occasional sense of personal power, accomplishment, and reserve energy; will provide occasional periods of relaxation and easy effort; will offer occasional tasks stimulating to the maximum his available effort and ingenuity; will, in its development, provide for effective use of the results of mental growth and acquired knowledge and skill. It is obvious that such neat psychological adaptation of the worker to his work is no trivial undertaking. All of this must be accomplished subject to the dominant economic considerations which determine most of the work of mankind.

(b) The hygienic vocation, mentally, should also be

suited to the worker's array of special aptitudes and disabilities. Such special talents as eloquence, verbal analysis, mathematical skill, physical stage presence, a rich and flexible voice, social charm, physical beauty, aptness in drawing and cartooning, a sense of humor, rugged honesty, mechanical aptitude, are random examples of rather special traits which many, who do not possess them, may seek in vain to cultivate. On the other hand are such traits as faulty sense of pitch, poor feeling for rhythm, muscular weakness, left-handedness, color blindness, stammering, epilepsy, tuberculosis, and the like, some of which, at least, cannot be materially changed through any degree of effort or diligence. Adaptation to special disabilities is likely to come eventually, through sheer trial and error, but in this way, if at all, only at the cost of much sorrow. Adaptation to special talents is not easily made unless some adequate technique of diagnosis and information is at hand quite early in life. No doubt there are things that most of us could do better than the things we are now doing. How are we to discover what these things are, and thus further our personal mental hygiene?

(c) The mentally hygienic vocation should fit the individual's present and prospective array of interests and enthusiasms. We have much to learn yet concerning the origin and permanence of interests, and concerning the technique of their discovery. We do know that specific interests have a most surprising way of changing as we mature, and that it is dangerous for a momentary enthusiasm to commit one to final choice of an occupation for life. Pending some discussion of interest later on, it is safe to say that for purposes of mental hygiene one's occupation should be capable of arousing whole-hearted

endeavor and zeal, to such an extent at least that the occasional periods and tasks of drudgery may be seen to have their own value in the final scheme.

DIVISIONS OF VOCATIONAL PSYCHOLOGY

Vocational psychology may be said to have two sides: the side of practice and the side of research. The aspect of practice may in turn be divided into two enterprises. The first is that of vocational guidance, the second, that of personnel selection. The enterprise of guidance seeks to assist the individual in his choice among the many available vocational possibilities. Its interest is not so much in getting the world's work done most effectively as in achieving the maximum results for the individual, in the face of such opportunity as the world's work affords.

Vocational guidance is attempted in various ways: by parents and friends; by teachers or vocational guides in schools; by professional vocational counselors of honest intention, from motives of equitable exchange and humanitarian welfare; and by numerous quacks and charlatans, from motives of quick and easy personal profit.

Vocational guidance is necessarily more comprehensive than vocational psychology. The adviser of youth must consider physical and economic, local and geographic facts, educational and social influences, current labor demands and conditions, the healthfulness, wages, supply, stability, dangers, and probable future development of various lines of work—all as related to a particular individual at a particular time and place. Numerous factors must be handled that have but little to do with scientific psychology. Such work, as at present conducted, must be very

general and advisory in character, or else take merely the form of finding the best possible job at present available for those in need of immediate work. Vocational guides, especially in schools, may render highly important service to the young. They are eager to take advantage of whatever valid results and methods vocational psychology has to offer.

Personnel selection, on the other hand, has developed chiefly in the interest of employers of labor, although it is also full of significant social value. Realizing the importance of fitting workers to their work, employers have sought for better methods of employee selection. From a group of applicants it is required to select those best fitted, either immediately or eventually, for specified tasks and operations. In every large industry the work of receiving, examining, testing, selecting, rejecting, and placing applicants may become an elaborate branch of human engineering. The personnel department is also likely to be charged with the welfare and the relations of employees, with their initial training, their promotion, modes of remuneration, and many related projects.

Manuals of vocational guidance are relatively few; volumes on personnel procedure, however, are both numerous and bulky. The present book is neither a handbook of vocational guidance nor a manual of personnel procedures. It represents the aspect of research rather than that of practice. It endeavors to survey the available results of scientific inquiry, on which must be based both guidance and selection. It is interested chiefly, therefore, in problems and their solution, rather than with techniques and their use. But since most of the results have been accumulated with their practical value uppermost in mind, the

book should also serve as an introduction to both the fields of practice.

We shall encounter many of the problems of vocational guidance, and indicate what contribution psychology may now make toward their solution. We shall review many of the techniques of employee selection, since most of these are still in the empirical or experimental stage of their development. Our interest in all such procedures, whether of guidance or of selection, will be partly critical, comparative, evaluative. But most of all our concern in every case will be with the possibilities of improving these methods, by making them more cautious, more reliable, more equitable, and more productive.

CHAPTER II

ANTECEDENTS OF VOCATIONAL PSYCHOLOGY

VOCATIONAL MAGIC

Among very primitive people we find the recognition already established that the course of the individual's fortune depends on two distinct factors: external forces and personal characteristics. Individuals similar in type experience different fortunes because of the different external events that attend their career; individuals of diverse characteristics suffer the same fortunes at the hands of some common or identical external occurrence. Two combatants of equal skill and valor are rendered unequal by a defective lance; two runners equally swift are made unequal by a pebble in the path; a vigorous babe fails to mature properly because of pestilence, war, or famine. On the other hand, both young and old, weak and strong, stupid and cunning, are alike reduced to helplessness in the face of flood, earthquake, and forest fire.

Primitive thinking, in its attempts to control the course of personal fortune, thus had its attention directed to two groups of factors, each of which it sought to control by such means as it could at the moment devise. A very early stage of such thinking took the form of the belief that *desire* could impress itself on the course of physical events and also on the development of personal characteristics. The expression of desire, either of the individual immediately concerned or of others more remotely in-

volved, was consequently invoked and declared in more or less emphatic and overt form as a determining factor in personal fortune. In many cases this expression was given some indirect or symbolic form, as in gesture, ritual, tableau, masquerade, and imitative portrayal.

On the side of physical factors this attempt took the form of crude magic, adjuration, sacrifice, and incantation, all of which were calculated to dispose the physical elements favorably toward the individual concerned in the ceremonials. Crude ritual observances and ceremonies, such as sacrifice, mimicry, and tableau, were believed to influence in some occult way the growth of crops, the changes in weather, the health of enemies, the movements of game, the supply of fish.

A typical fishing expedition among the natives of the Caroline Islands aptly illustrates this point of view. The chief official is not an expert boatman nor a fisher, but the medicine man of the tribe. He owes his authority not to his knowledge of the habits and haunts of fish, but to his store of incantations and exorcisms. Various rites are conducted before embarking. The fishermen must leave the island without speaking; and, especially, the purpose of the expedition must not be mentioned aloud. A "luck" formula is pronounced over the boat. Sacrifices of special foods are offered, lest the lines be broken by sharks or tangled in the rocks. In Mexico, an elaborate pantomime, representing the harvesting of crops, was staged annually at a religious festival. This was believed sufficient to produce the good crops which were desired for the next season. Special dances were performed by persons representing the various vegetables which were particularly coveted.

Among primitive races in almost every part of the

world one finds magical properties attributed to a sort of toy which anthropologists call the "bull roarer." It consists merely of a flat stick, attached to the end of a cord. When whirled around it produces a roaring or humming sound which easily reminds one of the rumble of wind, the roll of thunder, or the distant cry of an animal. In various quarters this instrument is used in a ceremonial way. Since its sound resembles thunder, it is used as a charm against that form of physical violence. Because of its resemblance to both thunder and wind, it is incorporated in elaborate rain-making mysteries. Sometimes it is used to drive or call wild or domesticated animals, and hence comes to be used as a means of bringing luck to hunters. Figures and emblems, carved on the slab of wood, are supposed to specify the particular kind of luck or fortune which the individual seeks.

On the side of personal characteristics the same endeavor took the form of blessings, incantations, dedications, curses, prayers and petitions, the wearing of symbolic charms, and the submission of the infant or youth to a variety of prenatal and childhood experiences and ceremonials. Thus it is believed that by appropriating a dead man's spear and thereby expressing a desire for his skill and valor, these traits of character will pass to the new owner. Boys are tossed into the air to make them grow tall, and rubbed with crystals and snake-skins to make them clever and intrepid medicine men. By scratching lifelike sketches of bison, deer, and fish on rocks, walls, and weapons, the savage hunter sought to acquire otherwise unattainable adroitness and success. "Disease or death may be produced by operating on the cuttings of a person's hair, the parings of his nails, or the remains of

his food, when the person himself is far away. By wearing tiger's teeth a man may make himself brave and fierce." By drinking the blood of bulls he may become stalwart and powerful. The Ojibway Indian, in order to hurt his enemy and thus further his own interests, makes a small image of him and pierces it with a needle in the faith that the enemy will suffer. In order to terminate the latter's career he burns or buries the effigy, uttering magic words as he does so.

Remnants of this primitive magic still persist in the "psychological underworld," and many an old-wives' practice and incantation is in various quarters still believed or professed to further the course of the individual's fortune, or to jeopardize it, by rendering natural forces more benign or malignant, or by exerting some occult molding influence on the infantile abilities and propensities. Thus it is not at all uncommon, even in these days, for children to be dedicated at birth to the ministry, the missionary field, the service of the king, or to some particular cause or propaganda. A woman of the writer's acquaintance, solicitous for the future welfare of her babe, read solid and serious books during gestation in order to balance the emotional influences due to her absorption in music teaching during that period. Many practices of the most superstitious kind are resorted to in order to predetermine the sex, and hence the vocational prospects, of children yet unborn. Reliance on prayer as an effective agent in changing the course of events or the disposition and habits of some other individual is by no means confined to savages. Petitions that a neighbor may lose his appetite for drink, recover his lost eyesight, or find his wallet are as current in modern times as are official days of prayer

for rain. Seeking to influence public opinion by the passing of formal resolutions, and modifying character, curing diseases and prolonging life through "absent treatment," the laying on of hands, the contemplation of relics, visitation of shrines, and concerted supplication are practices which find high warrant in contemporary life. The essential idea behind all these practices seems to be the simple faith that nothing will interfere with the realization of desire, if only that desire is indicated by a method which has official or traditional sanction. The true nature of cause and effect and the conception of natural law are not yet realized on this level of thought.

THE PRACTICE OF CLAIRVOYANCE

A more advanced stage in the development of such thinking is indicated by the recognition that both the series of physical events and the individual endowment follow laws which transcend the personal desires of men. Nature comes to be recognized as a system of facts and connections. Both control and foresight henceforth seek to base themselves on the utilization of these stable laws and relationships. Instead of willing the individual's fortune to be thus and so, there is an earnest endeavor to seek for signs and clues of what that fortune is inevitably destined to be. Fortune-making becomes fortune-telling. The accidents and accompaniments of birth, the momentary positions of the planets, the calendar incidents, the hour or day of birth, the local meteorological conditions, birthmarks, stigmata, physiognomic and anthropometric characteristics, the folds of the flesh, the lines of the hand, the mode of birth: every fact that can participate in a relation of coincidence with the birth of the individual is

selected as a sign of some future state of affairs, desirable or untoward, in the fortune of the individual, of his personal, domestic and occupational career.

Thus, in a recently published guide to character analysis based on ancient astrological pretensions, the following characteristics are asserted to belong to those who are born in the month of February:

Those born in this month are very intuitive and good judges of character and human nature. They are successes in mercantile interests and enterprises. It is said that the best wives are born in this month, being always faithful and devoted. Great sincerity and power are possible for those born in this month. They rise to great heights and on the other hand are inclined to sink to the lowest depths. At times they are inclined to be melancholy, a tendency which they may overcome.

Most February persons have good taste, are quick at absorbing information, and intuitive. One of their great faults is that they are inclined to be intolerant and cannot make themselves think from another's point of view.

Their most common diseases are of the nervous and rheumatic orders. They should guard their actions on the ninth and sixteenth day of each month. Luck day, Saturday. Favorite colors, all shades of blue, pink, and Nile green. Lucky stones, sapphire, opal, or turquoise. Lucky numbers, 5 and 7. They will excel in music and art, and should marry with those born in October, January, or June.

Hardly less common than faith in the horoscope is belief in the detailed prophecies of palmistry. The following is a direct reproduction of paragraphs from a well-known metropolitan American newspaper, headed, "What Your Fingers Mean:"

Shorter palm and longer fingers, these show an aptitude for doing small things well. Their owners analyze every-

thing, are supersensitive over trifles, often feeling unintentional slights. When these fingers are slim, as well as longer than the palm, they give to one the quality of diplomacy. Card sharps and gamblers have these long, slim, smooth fingers. The average-length fingers with an ordinary-sized palm show a well-balanced mind, with a thoroughly commonplace nature. When long fingers (with shorter palm) are knotted at the joints we find an extreme love for the minor parts of construction, whether it be in the building of a bridge or the endless tasks pertaining to a kitchen.

The same thing happens in the case of the individual's own acts. Every petty move and caper is taken to be significant of his future disposition, powers, or achievements. The first word the child utters, the first object for which he reaches, the animal he first imitates, the form of his earliest play activities, nothing that can be identified and described but comes to possess, in someone's mind, some peculiar significance and prognostic value. "Homely in the cradle, lovely at the table," is an oft-quoted maxim among hopeful mothers. "Happy is the bride that the sun shines on," has doubtless served to postpone more than one nuptial ceremony, and being "born under an unlucky star" has equally often afforded a certain consolation for personal awkwardness. A father of the writer's acquaintance believed his boy destined to follow the career of a druggist or pharmacologist, because, as a child, "he was so fond of playing with bottles and of pouring water from one into the other." Any lack of submissive devotion to a rubber doll is calculated to fill the parent's heart with apprehension and dire forebodings for the domestic peace of his daughter. War-babies and infants born on the high seas are envied for their romantic prospects. Il-

legitimate children are expected to be idiotic or else to be especially gifted with some poetic form of talent.

Belief in vocational magic and clairvoyance is clearly not entirely confined to medieval days. Nor is it true that such instances as those just cited arise only as material for frivolous conversation or as journalistic space-fillers in a dearth of more serious copy. So firmly are these superstitions established among large classes of people that special legislation is required to prevent their exploitation at the hands of crafty fakers. The fortune-teller is far from being a romantic and vestigial institution; and the type of prophecy which medieval clairvoyance represents continues to provide many with a substitute for more rigorous and less exciting inquiry.

MODERN PERIOD OF GUIDANCE AND SELECTION

However, as knowledge develops, a third stage is reached, in which we may be said to be moving, even though somewhat slowly, in our own scientific and educational work. This stage is marked by relative inattention to the series of physical events and by special emphasis on the original nature of the individual and on changes wrought in that original nature through the experiences of school life and other forms of educational process. The conditions and environmental factors of life have become so plastic that individuals can fairly easily find congenial environment and occupational material near at home or far from it, if only they know for what environment and material their natural powers are best adapted. Modern life, whether in city or in country, has become so diversified and labor so divided, that a small community affords the vocational variety which only

a few years ago was quite unfamiliar to it. Moreover, the various avenues of communication, transportation, and coöperation have become so elaborate that workers in one part of a nation can with little difficulty profit by activities and opportunities existing in distant places. Each branch of industry, commerce, and art, as well as each professional and occupational activity, provides not only for a larger number of workers but for a greater variety as well. There is thus a tendency for the individual, at an early point in his career, not only to adapt himself to an environment already provided, but to a certain degree to select that environment for which his abilities and interests seem best to fit him.

Attempts at controlling fortune, as now exercised, are neither magical nor clairvoyant. They take the rational, selective form of fitting the individual to the place for which his natural aptitudes best adapt him, so far as these facts of adaptability are discoverable, and so far as the environment is plastic or optional. This is at least the description of the process in democratic conditions of society. In countries in which hereditary aristocracy and caste systems still exist, the fortune of the individual is determined to a considerable extent by his birthright, by the occupation of his father, above all by sex—all dominated by tradition. Within this field of guidance and selection, activity has developed rather independently in two different directions. There has been on the one hand the notion that all the individual needs for a satisfactory occupational adjustment is knowledge of available opportunities, and approximate technical training for the occupation of his choice. This point of view is seen in our own country in the popularizing of general education.

Under this conception general education, instead of being the prerogative of the ruling or moneyed class, is urged as a common right, a social duty, and an economic necessity. Learning is not limited to those who expect to enter the theological, medical, legal, or academic professions. A certain amount of elementary school knowledge, or at least of school attendance, comes to be required of every prospective worker. Even the feeble-minded are labored with in the attempt to bring them up to their highest possible academic level. Boys and girls alike are not only urged but compelled to equip themselves with the knowledge of the elementary formal subjects; and the community taxes itself to furnish the teachers, the books, and the necessary physical paraphernalia. In this earlier form of educational theory little effort is made to give immediate applicability to the subject matter of the curriculum. Classical studies with very little relevance to contemporary life; dead languages, with only a feeble claim to concrete serviceability; formal exercises in designing and constructing useless bric-a-brac; trivial geographical, astronomical, anatomical, and military details: these are the subject matter of the "general education." Back of their selection lies of course the doubtful conception that the general powers or faculties of the student are thereby cultivated, and that these may then be brought to bear effectively on any vocational activity which may be chosen.

The subject matter is selected, not because of its interest or its utility, but mainly because of its difficulty and its formal character. Parental compulsion, vague social tendencies and impulses, petty personal rivalries, fondness for the teacher, and general cultural aspiration

are relied on to facilitate the work of administration and to provide incentive. The "life-career" motive is but little utilized, and tends on the whole to be discouraged as sordid and commercial. But it is nevertheless believed that the grammatical, geographical, historical, and arithmetical elements will in the long run enable the pupil not only to enjoy life but to find it as well, or at least to be of the greatest possible service in the work into which he or she drifts. Only in the case of those who are utterly incompetent to deal with the general subject matter, the feeble-minded, the blind, and the deaf, is this formal education willingly abandoned in favor of some definitely serviceable "industrial" training.

THE METHODS OF INDUSTRIAL EDUCATION

Quickly following this effort of the public schools to guide every boy and a few girls into successful careers through general education, came the realization that literary, linguistic, and mathematical information alone is inadequate to this task. It was felt by many that industrial or vocational education, calculated to fit the individual directly for his or her life occupation, should be begun at a much earlier age than that at which the group choosing the professions entered upon their further studies in the higher technical schools. It became obvious that many pupils terminated their public-school education as soon as they had satisfied the minimal requirements of the compulsory education law. These engaged at the earliest possible opportunity in some immediately gainful occupation. The occupations into which they commonly drifted were such as called for only a slight amount of intelligence and promised proportionately little by way of fur-

ther equipment or promotion. They have come to be called "blind alley" occupations, and refer to such work as that of errand boys, elevator and telephone operators, small clerks, domestic servants, nursemaids, messengers, delivery boys, and teamsters.

Meanwhile those who had continued in school and completed the high-school curriculum emerged without special vocational fitness, and even without any knowledge of the vocational possibilities of their age and locality. The further development of vocational and industrial education of special sorts was then supplemented by general instruction in the vocational opportunities available. Vocational surveys were initiated for the purpose of acquiring information which could be placed in the hands of pupils and of those in charge of their training. These surveys made systematic inquiry into the vocational opportunities afforded to young people by the industries and enterprises of the vicinity. The assistance of employers was sought in the effort to learn the requirements of the various types of work; the nature of the labor involved; the wages; the general conditions, such as healthfulness, danger, companionship, and instruction; the rate of promotion; the prospect of future advancement. Such information has in many cases been published in pamphlets and bulletins and thus made accessible to teachers, pupils, and parents.

Along with this tendency went the attempt to give the pupil some first-hand knowledge of and immediate experience with the materials, implements, and products of the various industries from among which he or she might be expected to choose after leaving the school. This has been a difficult step to bring about, partly because

of the various technical and administrative difficulties which it involved. Occasional hasty visits to mills, factories, stores, shops, offices, laboratories, and similar busy places give the pupil but a superficial notion of the actual work of the operations there observed. More extended and intensive observation, on the other hand, with perhaps an actual trial at the work, means a corresponding limitation of the range of institutions inspected. Talks by managers and foremen are likely to give only a dramatized view of the facts. School industries, on the other hand, cannot easily be organized and conducted in a manner technically complete and industrially representative. The result has been a growing tendency to push the vocational training further and further back into the earlier years of the curriculum, thus displacing much of the purely formal subject matter. With this change have come various experiments in study-practice methods, in which part of the day or term is spent at the general academic work, and part in actual service in a tentatively chosen form of industrial or commercial activity.

In this movement but little recognition was given to the psychological differences and peculiarities of the individuals concerned. Knowledge of personal aptitudes and capacities, interests, and satisfactions, was more or less taken for granted in each case, or at least left to develop in its own way. It was assumed either that any individual could satisfactorily pursue any vocation in which he might become interested, or else that industrial and vocational information alone was needed in order to enable the individual to make a suitable choice. Nor was there any doubt that the work which the youth found interesting and attractive at the time was the work in which he

might find a maximum of ultimate success, satisfaction, and serviceableness. With the vocational surveys, the industrial schools, and the part-time practice methods of education we shall not be concerned, in what is to follow. They represent a movement of tremendous social and educational significance, but their development does not immediately concern that field of work which we have designated "vocational psychology." They proceed mainly by giving the individual a knowledge of the external series of facts and events, thus replacing the era of fortune-telling and clairvoyance, with its search for signs and omens, just as fortune-telling had, in its own day, replaced the practices of crude objective magic. But the methods of industrial and occupational training have been found to solve only one aspect of the vocational problem; it is more and more coming to be realized that a thorough understanding of the aptitudes which the individual brings to his work is as important as the knowledge of the opportunities which the environment affords. In the remainder of this book we shall be more concerned with the various systematic efforts that have been made or are now being made to study the individual himself, and to judge from a determination of his mental characteristics the type of vocational activity which he is best fitted to undertake with success.

CHAPTER III

PHRENOLOGICAL AND PHYSIOGNOMIC SYSTEMS

Primitive magic, directed toward the formation of individual character, was displaced by the personal clairvoyance which attempted to diagnose the individual's mental and moral constitution on the basis of his own early acts, expressions, and physical characteristics. This soon gave way to a tendency to abandon, for the most part, such signs as did not relate in some actual or fancied way to the individual's brain. This limitation of the field of significant signs may be related to the widespread interest in human physiology, historically associated with the knowledge of anatomy. The invention of the microscope, Harvey's proof of the circulation of the blood, the discussion centering about the automaton theory of Descartes, and the rapid development of surgical technique, brought about a most interesting spread of curiosity concerning the nature and mechanism of the human body. Balls and tournaments gave way to dissections and demonstrations as means of courtly entertainment. Celebrated surgeons exhibited their skill and knowledge, and lectured on the facts of physiology and anatomy in the formal presence of royalty and society. Court painters executed pictures such as "The Anatomy Lesson," some of them now cherished as famous masterpieces.

LOCALIZATION OF BRAIN FUNCTIONS

Especially keen became the interest in the skull and brain in which, as Descartes taught, might be found the seat of the soul. Among the earliest of the rough discoveries was that concerned with the localization of special sensory and motor functions of the organism in particular regions of the brain. It was observed that irritation of certain parts of the surface or "cortex" of the brain, in cases where a portion of the skull had been removed, was followed by movement of particular parts of the body, and that individuals who had suffered from injury to certain parts of the brain seemed, on recovery, to be quite their usual selves, except that certain special capacities, as for instance the function of speech, were interfered with or quite destroyed. The unitary soul, described by Descartes as probably having its seat in the pineal gland, now bade fair to disintegrate into various minor faculties, each with its separate brain mechanism and its particular abode in some region of the skull.

The discovery of these elementary facts of brain localization was at once hit upon with zeal by those most interested in the means of foresight into human fortunes. Ignoring the fact that the localized features were simply the control of other parts of the body, as eyes, ears, limbs, speech organs, and the like, these enthusiasts leaped to the conclusion that every trait of character and every mental aptitude, every virtue and vice, ability, interest and capacity, had each its own shelf or pew in the brain area. Moreover, it was taken for granted that the relative development of these various characteristics was indicated by the depressions, projections, and proportions of

the skull bones. Here was light indeed on the destinies of men, their fitnesses and propensities, their appropriate choice of work and play! The enthusiasm and ardor that went into the elaboration of the new clairvoyance of phrenology would have meant most valuable increase in our knowledge of brain physiology had it been directed exclusively toward further legitimate inquiry. But the urgent desire for control and foresight was too great for practice to keep the slow pace of scientific fact.

Hastily the prophets drew up complicated and minute maps of the surface of the cranium and assigned to each recognizable patch some "faculty" which stood for an important mental or moral trait. Casual examination of the skulls of friends who chanced to possess particularly marked traits to an extreme degree was in some cases relied on to give guidance in the assignment of these patches to the respective traits. In some of the schemes the human traits conceived were so numerous that the bilateral symmetry and functions of the brain were ignored, and the two sides of the skull were assigned quite different functions. Thus arose phrenology, one of the most persistent fallacies of vocational analysis. This movement was founded by Gall and Spurzheim, two physicians and anatomists, in the latter part of the eighteenth century.¹ With the customary naïveté of the medical science of their time, they overestimated the significance of casual observations and fragmentary discoveries, and thus gave impetus to the exaggerated and extravagant claims made by their enthusiastic followers. "Phrenological societies" devel-

¹ An interesting review of the origin and development of phrenology and other systems of character analysis is given by Joseph Jastrow, in an article in *Popular Science Monthly*, June, 1915.

oped so rapidly and so widely that the movement became relatively independent of the scientific investigations which should have served to qualify and criticize its doctrines. Its propaganda was so vigorous and the practical needs which it promised to satisfy were so insistent, that even today many people hold tenaciously to its dicta. Scores of professionals thrive on their lucrative practice of its dogmas, and university graduates smile in a guilty way when asked, "Do you believe in phrenology?"

The tenacious persistence of phrenology, the degree to which it is still resorted to and paid for by inquiring and earnest seekers after satisfactory paths through life, make it seem worth while to present a brief statement of the numerous errors and flagrant stupidities on which the practice of phrenology is based. It may also be worth while to suggest some of the rather interesting subsidiary reasons for its persistence as a cherished popular delusion and even as a topic for current scientific discussions and papers.

ASSUMPTIONS AND ERRORS OF PHRENOLOGY

Underlying all of the various phrenological systems were four common assumptions which, briefly stated, were:

1. That such cerebral localization as exists is of fundamental and specific traits of character or types of ability, such as secretiveness, circumspection, love of babies, generosity, veneration, constructiveness.

2. That the more developed any one of these given traits is, the larger will be the supposed area of the brain which contains its supposed organ.

3. That since the skull fits fairly closely to the brain surface, the relative development of a given portion of

the brain will be indicated by the relative prominence or size of the different parts of the cranium, so that the degree of possession of the trait may be judged from an examination of the exterior of the skull.

4. That the occasional casual observation of coincidence between particularly marked mental qualities and particular cranial characteristics is a sufficient basis for inferring universal and necessary connection between these two features.

Each of these assumptions involves obvious error and misapprehension in the light of what is now known concerning the nature of the human mind and the structure and functions of the brain. In order that these fallacies may be clearly disclosed the four main assumptions will be examined independently in the order in which we have here presented them.

1. In the first place, the only sort of localization of functions that has been authentically established is the projection, upon the brain structure, of the other parts of the organism, and the localization of sensori-motor centers which function in the connection of these various organs. Thus it is known that each of the principal groups of muscles of the body has its so-called center in the brain. From this part of the brain to the muscles concerned run bundles of motor-nerve fibers, so that activity in that particular part of the brain may result in the conduction of nervous impulses to these muscles, and in their consequent contraction. Thus the hand, the foot, the eyes, the speech organs, may be said to be functionally represented, and in this sense localized, in particular regions of the brain. The same thing is true of the sense organs, as the eye and ear. Each incoming sensory nerve

tract runs to or through some portion of the brain. Injury to this part of the brain results in functional incapacity of the corresponding sense organ. The cortex, or outer surface of the brain, may thus be conceived as a sort of terminal station for nerves from other portions of the organism, a sort of projection center which enables them all to take part in a functional unity of action. The functions which can be said in this sense to be localized in the brain are such sensori-motor capacities as the ability to raise the right arm, the ability to balance the body when standing erect with eyes closed, the ability to see, the ability to move the eyeball, the ability to feel pain in a certain area of the skin, the ability to articulate words, to understand spoken or written language, to call up a visual memory of a particular thing previously seen, and the like.

The integrity of various parts of the brain is essential to the proper coördination of all the sensibilities and responses of the individual. Traits of character and types of ability, however, depend on the characteristic modes of reaction of the organism as a whole to the factors of its environment. Thus generosity as a human trait does not depend on the massiveness of any set of muscles, nor on the keenness of any sense organ, but upon the characteristic type of reaction and motivation which the individual as a whole displays. Jealousy, love of children, destructiveness are characteristic modes of behavior of the whole organism, and depend upon reactions which the given situation evokes, not upon some special organ.

2. As to the supposed correspondence between size and functional capacity, no evidence has been presented which demonstrates that even the strength of a muscle or the

keenness of a sense organ depends in any way on the absolute size of the brain area concerned with it. Nor has evidence been presented to prove the existence, within any given species, of correlation between volume, shape, or weight of the brain tissues and even the more general traits of character or ability. In the absence of such evidence we are led to believe that functional capacity depends on complexity of structure, chemical, molecular, and functional, rather than on the factors of mass or shape. But even the nature of these correlations is as yet largely unknown. The persistence of the faith in the significance of mass and shape probably rests in part on the apparent existence of such correlation when different species are roughly compared with one another. Thus, among the higher vertebrates there seems to be a relation between what we may call the general intelligence of the species and the erect carriage of the body. From the quadrupeds, with their horizontal position, through the apes, with their semi-perpendicular mode of life, to the human being, with his erect carriage, there is also a progression in prominence of the forehead, opposition of thumb and finger, relatively greater development of the cerebral mass, and also in mental capacity. The intelligent human being walks in a more erect posture than does the stupid ape. But no one has ventured to assert that a relation exists between erectness of carriage and mental ability when human beings are compared with one another, or when apes are compared with one another. Similarly in the case of the physical features of the brain, the crude relationships which exist empirically, as between different species, seem to be quite slight in significance when compared with the differences in chemical, molecular, and functional complexity which

are found among members of the same species. Attempts to discover correlations between mental and moral characteristics and various brain constants we may expect to continue for a long time. What discoveries may be in store for us we do not know. But the important point in the present connection is that, for the purposes of vocational psychology, the practices of phrenology are based on evidence no more relevant to its pretensions than were the "proofs" pointed to by palmistry, horoscopy, and prenatal magic. Through cranial measurements alone it is impossible to determine with certainty the race, age, or sex of an individual, or even, indeed, whether he was a prehistoric savage, an idiot, or a gorilla.

3. As for the third assumption of phrenology, namely, that brain development is reflected in the cranial size or protuberances, it should be sufficient to point out that even if this were so it would be meaningless for our purpose, since we are compelled to abandon the belief in a relation between mass of tissue and even the simplest sensory or motor capacity. But such further disproof as may be required is readily furnished by an actual attempt to remove from their cranial boxes the brains of various animals, and by noting that the shape and thickness of the bones give little indication as to whether brain tissue, cerebrospinal fluid, or supporting tissues are to be found underneath a given protuberance or depression.

4. The fourth assumption of phrenology, that sparse and casual observation of striking cases is sufficient ground for generalization, we should be able to dismiss at once as utterly inadequate and miscalculated. It is impossible to find consistent recorded instances in which groups of individuals, selected at random, with definitely

determined and measured mental or moral characteristics, have been shown to confirm, by their cranial geography, even the most elementary doctrines of that phrenology which still offers to diagnose the individual's psychic constitution and to recommend to his future consideration the vocation of engineering, publishing, or preaching, as the case may be. Practicing phrenologists have repeatedly been invited to submit one bit of objective evidence for their pretensions, or to submit themselves to tests under controlled conditions. The invitations are refused, and the inquirer is referred instead to the dogma of some foreign and deceased authority. Such investigations as have been recorded have resulted in negative conclusions, or in contradictory data, or in coefficients with such high probable errors as to make the figures unreliable.

THE PSEUDO-SCIENCE OF PHYSIOGNOMY

Very often practicing phrenologists and phrenological vocational experts seek to justify their operations and pretensions by pointing out that they do not rely solely on the cranial geography, but more often on other characteristics of the individual's body, such as the concavity or convexity of his profile, the shape of his jaw, the texture of his skin, the shape of his hands, the color of his hair and eyes, the proportions of his trunk. Contemporary vocational counselors who have enjoyed some vogue and commercial repute are especially given to citing these criteria; several recently published tables of these clues are available. Historically, the attempts to formulate principles of physiognomy antedate phrenology by many centuries. Logically, however, physiognomy follows phrenology, as a transition from the formulation of structure to

the formulation of behavior. There is a very widespread belief that many mental and moral characteristics betray themselves in special facial items. The shifting eye, lofty brow, massive jaw, thin lips, large ear, protruding or receding chin, dimple, wrinkle, tilted nose, thin skin, prominent veins, and many other characteristics have come, in fiction and in table-talk, to symbolize specific characteristics. The same thing is true of the shuffling gait, the erect body, the protruding paunch, the curved shoulders, enlarged knuckles, stubby or elongated fingers, the short neck, the long arm, and the manner and rate of stride. It is but a step from these to the signs afforded by clothing, its selection, care, and mode of wearing.

Here is indeed a most confused mass of fact and fancy which finds credence in varying degrees on diverse occasions. Seldom has it been analyzed into the definite types of material which it really contains, and its evaluation is commonly left to the haphazard opinion of each individual. There is no doubt that we all tend to form our opinion of a stranger's probable characteristics partly on the basis of these physiognomic, physical, and sartorial factors. To what degree can these items be formulated so as to afford reliable criteria in the analysis of personality, as in the case of vocational selection and employment? We may perhaps best answer this question by noting the various sources of the belief in the validity of physiognomic and similar signs.

1. It is first of all true that many of these marks are the result of habitual activity, and in so far as they originate in the expression of a trait, they may be said to be signs of it. That the studious come to be round-shouldered, the cheerful to have smooth countenances, the guilty to

have furtive eye movements may well be expected. But it is quite another thing to reverse the proposition and to take stooped shoulders as a universal sign of academic interests, dimples as a sign of guilelessness, and nystagmus as the symptom of a criminal past. It is, however, often safe to use these traits as reliable signs of the established general habits and attitude which they express. We have all done this since earliest childhood; yet any attempt to classify formally the signs and effects of habit and constant expression would be pedantic. Unfortunately for the purposes of vocational guidance of youth, these expressions require for their formation habits of fairly long standing, and the critical period for psychological guidance is likely to be passed long before these settled habits have set the features into their identifiable molds.

Somewhat more hopeful is the reliance on expressive movements as indicative of passing and transient emotional states and attitudes. Not easily can we conceal from the astute observer the momentary passion that may be stirring us. Prolonged intimate acquaintance with an individual's emotional experiences and expressions may in time reveal to an observer the deeper lying and more permanent affective trends, the moods and sentiments which indicate what we are accustomed to call the temperament of the individual. Insight into the nature of these expressive movements is one of the useful things to be derived from long and patient study of human nature, both at first hand and through the classical descriptions of emotional expression. The more one observes and the more individuals he observes, the more he is impressed with the final variety and informal complexity of these expressive movements, and their dependence on a vast

detail of circumstance, which again forbid rule-of-thumb formulation.

2. Another apparent source of these beliefs is in analogy. The clammy hand, the fishy eye, the bull neck, the "blotting paper" voice, the asinine ear, the willowy figure, the feline tread, and scores of such phrases indicate that these characteristics remind us definitely of various species or objects other than the human being, and that we expect to find back of them the characteristic traits, habits, and instinctive tendencies of those species. We seldom proceed so far as to check up our expectations with facts, under controlled conditions.

3. The affective value of these analogies and their incorporation in poetry, song, and fiction as adequate figures of speech lead us to react to these traits in ways determined largely by the traditional usage. We are humble before the "high-brow," merry in the presence of the dimpled, cautious and prudent before him of the shifting eye. In so far as human reactions are determined by the implied expectations of associates and the demands of immediate circumstances, we should be surprised indeed if the "high-brow" did not, on the strength of his cranium, evade our office-door sentinel, the dimpled one respond to our facetious comment, and he of the shifting eye be forced to steal for a living.

4. Another source of these notions is mainly responsible for such of them as refer to definitely undesirable traits. This is the belief, so well played upon by the school of Lombroso in criminology, that many of these characteristics, along with the so-called physical stigmata, are indicative of a degenerative or atavistic trend in the constitution of the individual. Among these stigmata were

enumerated every conceivable extreme variation of every identifiable part of the human anatomy. Lombroso was inclined to believe not only that the presence of such traits was a certain mark of criminal propensities, but even that various types of criminals could be recognized by the cataloging of their stigmata, as thieves, murderers, forgers. The history of the criticism of this view need not be repeated here. Suffice it to say that we now understand that the underlying truth of the matter is only that these stigmata are somewhat more frequent among the vicious, degenerate, and defective groups than they are among people selected on the basis of their morality and intelligence. The criminally inclined individual may possess no stigmata, while an Abraham Lincoln may possess several of them, and in marked degree. To be sure, when an unusual number of stigmata are presented by an individual, we feel disposed to suspect that the abnormal condition is not confined to his bones and peripheral organs alone, but is probably so deep-seated as to involve his nervous system as well. But on the basis of these stigmata alone we are quite unable to decide whether he is an imbecile, a degenerate criminal, a pervert, a genius, or only an average man, with an undue burden of physical infirmity; still less can we diagnose his special mental or moral qualities.

5. A further source of these physiognomic beliefs may be discerned: namely, the fact that the features of a stranger are very likely to call more or less clearly to our memory some other acquaintance whose traits we know, to our sorrow perhaps, and whose features or manner or voice or apparel chance to be very similar to that of the stranger. At once we are inclined to endow the stranger

with the character of the individual he resembles. We seldom accurately check up these impressions on the basis of subsequent discovery. Indeed we are much more likely to evoke the suspected traits by our own attitude and by our treatment of the stranger, and we are eager to pounce upon any act that may be construed as a confirmation of our snap judgment. It is obvious that these impressions will vary from individual to individual and that any attempt to formulate them would expose their fallaciousness.

6. Finally, in this analysis of the origin of our belief in the signs of physiognomy, is the mere insistence that as a matter of fact there are definite relationships discoverable and formulable between typical features and typical characteristics of personality. Beliefs of this dogmatic kind are most likely to be exploited by the professional counselor, since they appear to the examinee to be unknown, mysterious, esoteric facts. The following formulations, taken from an account of the performance of one of the most widely advertised of professional vocational counselors, may serve as an example of this type of dogmatic physiognomic doctrine.

The sensitive, delicate-minded man usually has a fine-textured skin; the coarse-minded man a coarse-textured skin. It is an embryological fact that the skin was and is the original seat of all sensations, and that spinal cords and nerves are but modified and specialized in-turned skin. Of necessity a man's skin indicates the texture of his brain.

Texture is a great classifier of humanity. The individual of fine hair, fine-textured skin, delicately chiseled features, slender, graceful body and limbs, as a general rule, is refined, loves beauty and grace, and likes work either purely mental

in its nature or offering an opportunity to handle fine, delicate materials and tools. On the other hand the man with coarse hair, coarse-textured skin, and large, strongly formed features inclines as a general rule to occupations in which strength, vigor, virility, and ability to live and work in the midst of harsh, rough, and unbeautiful conditions are prime requirements.

It is no secret to observant employers of labor that blondes, as a general rule, are changeable, variety loving, optimistic, and speculative, while brunettes are consistent, steady, dependable, serious, and conservative.

It turns out as one might naturally expect that the man who resembles the greyhound in form is quicker, keener, more responsive, and less enduring than the man who resembles the bulldog in form.

A most cursory examination of the portraits of poets, educators, and essayists will show a marked tendency in them to resemble the triangle in structure of the head and body—both head and body wide above and narrower in the lower portions. An examination of the portraits of a hundred great generals, pioneers, builders, engineers, explorers, athletes, automobile racers, aeronauts, and others who lead a life of great activity will show a general tendency toward structure on the lines of the square—square face, square body, square hands. Reference to the portraits of great judges, financiers, organizers, and commercial kings will show a general tendency toward structure upon the lines of the circle—round face, rounded body, and a tendency to roundness in hands and limbs.

Anything which is hard in consistency has comparatively great resistance and persistence. That which is elastic in consistency is adaptable and seems to have spring, life, and energy within it. These principles have been found to apply to human beings.

These assertions are stated as *ex cathedra* dogmas. No objective evidence of an adequate sort is cited. We shall see that experiments do not confirm them.

EXPERIMENTAL TESTS

Schneider reports an attempt to verify the principles of a certain system of physiognomics by putting them to an actual test. He writes:

A group in the scientific management field affirmed that an examination of physical characteristics such as the shape of the fingers and shape of the head, disclosed aptitudes and abilities. For example, a directive, money-making executive will have a certain shaped head and hand. A number of money-making executives were picked at random and their physical characteristics charted. We do not find that they conform at all to any law. Also we found men who had the physical characteristics that ought to make them executives, but they were anything but executives. A number of tests of this kind gave negative results. We were forced to the conclusion that this system was not reliable.

Many of the pretensions of physiognomic systems have been submitted to experimental tests, always with negative results. Thus Paterson and Ludgate investigated the claim that blondes and brunettes possess characteristically different traits.² Twelve "blonde" traits and twelve "brunette" traits were selected from the dogmatic enumerations of one of the popular systems of "character analysis." These were arranged in a list in random order, and presented to nearly one hundred persons, each of whom was asked to think of two decided blondes and two pronounced brunettes of his acquaintance. For each of these, each person checked the list of traits by marking them plus or minus, thus indicating, according to his judgment, the

² Paterson and Ludgate, "Blonde and Brunette Traits," *Journal of Personnel Research*, 1922, Vol. I, pp. 122-127.

possession or non-possession of the trait by the individual in question.

Since the judges were not familiar with the claims of the "character analysis" system, it was believed that such a test would indicate the tendency to correctness or incorrectness of the system's claims. The results failed to confirm the system. Blondes were as likely to possess "brunette" traits as those ascribed to them by the system. And brunettes were equally likely to possess alleged "blonde" traits. Thus 81 per cent of blondes and 84 per cent of the brunettes were judged to be "positive," an alleged "blonde trait." Blondes are asserted by the "system," to be "dynamic." And 63 per cent of the experimental blondes were thus rated. But so also were 64 per cent of the brunettes. There was of course irregularity from trait to trait in the results, but the alleged correlation between complexion and character quite failed to be confirmed.

In another instance ³ thirty people were carefully measured in two hundred and one different physical features, claimed by various physiognomic systems to be reliable indexes of character traits. The same people were then rated for the alleged traits by groups of their intimate associates, on the basis of acquaintance with them. They were also rated for the traits by groups of judges unacquainted with them, before whom they appeared for general inspection, without accurate measurement.

The physiognomic measures showed no correlation whatever with the judgment of acquaintances, and the correla-

³ Cleeton and Knight, "Validity of Character Judgments Based on External Criteria," *Journal of Applied Psychology*, 1924, Vol. VIII, pp. 215-231.

tion of the measures with the verdicts of the casual observers was also practically zero. The casual observations correlated a bit better with the judgments of associates, although the correspondence was so low as to be unreliable. This suggests that the judgments of friends might also have been based in part on vague general impressions of appearance and bearing. The judgments of practicing physiognomists are also no doubt in large part based on just such general impressions, for careful measurement and comparison of physical features is seldom even pretended by these performers.

Cleeton and Knight, who conducted this investigation, conclude that "the average of 201 correlations between various physical traits and our criterion is .00 with the correlation varying from .00 as chance would account for. Physical measurements which underlie character analysis agree neither with themselves nor with other measures of character."

Hull ⁴ has described a number of investigations conducted at the University of Wisconsin, in which various anatomical characteristics were compared with academic aptitude and with proficiency in the mastery of certain special subjects. The experiments on blonde and brunette coloring as signs of temperament confirm previous investigations. Certain head measurements, by specially devised instruments of prevision, gave better than chance correlation with aptitudes of the scholastic type, and it appears that some such measures are perhaps somewhat more significant than others. Various other experiments are reported, which show the carefulness with which modern

⁴C. L. Hull, *Aptitude Testing* (World Book Co., Yonkers, N. Y., 1928), Chap. IV.

laboratory methods are being used to check up the familiar assertions of impressionist character analysts.

The formulated facts of physiognomy are so unsupported, contradictory, and extravagant that the vocational psychologist cannot afford to trifle with them. General impressions on the basis of the totality of an individual's appearance, bearing, and behavior we shall always tend to receive. Whether one judges more accurately by an analytical recording of each detail or by ignoring these in favor of his own, more or less unanalyzed, total impression has never been demonstrated. Under any circumstances one is likely to look about for such details as may lend support to the total impression. But it is quite unjustifiable, though perhaps commercially expedient, to pretend that the judgment is really based on the details selected. The mere facts of physical structure, contour, shape, texture, proportion, color, and the like yield no more information concerning capacities and interests than did the incantations of the primitive medicine man or the absurd charts of the phrenologists. In so far as character and ability may be determined by facts of structure, it is apparently by the minute structure of the biochemical character of the microscopic elements of the brain and other vital tissues, about which we now know exceedingly little.

CHAPTER IV

TRADITIONAL METHODS: I, THE LETTER OF APPLICATION

DIAGNOSING HUMAN CHARACTER

The diagnosis of human character is an enterprise in which all men, women, and children engage. From infancy to senility we are impelled to attempt it, and to venture our own hopes on the accuracy of our judgment. Personal adjustments, family life, social companionships, business relations, politics, and diplomacy alike depend on more or less accurate knowledge of the qualities of men. Even a dog, to be happy, must learn to discriminate between the signs of friendliness and those of an evil intention.

In most situations, however, it is the perception of character, rather than the judgment of it, on which we rely. The distinction between these two methods, though not to be sharply drawn, is nevertheless essential. Through repeated and prolonged experience with another, in varied circumstances and under varied provocations, we come to *know* his character. For by character we mean essentially the characteristic modes of behavior, the characteristic attitudes, reactions, and capacities. Prolonged acquaintance gives as direct a perception of character, in this sense, as it does of the qualities of foods and climates or the properties of physical objects.

Judgment of character, as distinguished from its perception, is a more indirect process, in which, from a

momentary observation or a cross section of the life of another, we attempt to estimate its general quality and tenor. Judgment, in this sense, is diagnosis. It relies on symptoms, signs, clues, and incomplete evidence. It is an inference from the quality of a detail to the quality of the larger whole.

Whether we judge or whether we perceive character will thus depend in part on the degree of acquaintance—on the amount of information at our disposal. The total stranger and the individual only occasionally seen, we must judge. The character of our more intimate associates we know directly, from having more fully experienced it. For the character of a man is not some hidden substance or possession, nor is it a mysterious spiritual essence. A man's character is his actual behavior, when all of his conduct is considered. Lovableness is just the degree to which people are fond of us; kindness and benevolence are present to just the degree that people are actually gratified and comforted by our conduct. Just as the value of a commodity depends on what people will actually pay for it, so human traits are constituted by the degree to which they are actually manifest. A single bid at an auction may not tell the whole story of an article's worth, nor an isolated symptom disclose the whole of a patient's disease; neither may the single act of a man reveal his whole character. But the final bid and the differential symptom have high significance. So also may some of a man's acts be more significant than others.

The earlier, in our acquaintance with another, we seek to formulate and express his temperament, interest, or ability, the more we must rely on judgment and the less

on full perception. Judgment, in the sense in which we use the term, is an indirect approach to knowledge through the interpretation of signs, cross sections, or partial details. In many human relations this type of character estimate must be relied on, since full acquaintance is lacking, or since action must be taken before full acquaintance can be attained. Especially is this the case in business relations, in which people must be selected from a larger number, employed for particular work, promoted to positions of responsibility, consulted concerning matters of moment. In general, any executive dealing with large numbers of individuals can know these individuals only indirectly and through their occasional acts. Operators must be hired, apprentices chosen, clerical workers selected, instructors provided, to handle increased volume of work or to take the place of those who are dismissed, promoted, or retired. In all such cases the executive or foreman must exercise his judgment, and must exercise it upon such data as are available. It is our purpose to examine, somewhat closely and experimentally, this judgment and these data.

THE LETTER OF APPLICATION

Under modern conditions the personnel of a business or institution comprises so many different individuals, and activities are carried on in such large centers or in such remote districts, that employees and assistants must often be chosen without the personal acquaintance of the superintendent or executive. At least the initial applications for a given place are often so numerous and submitted from so great a distance that even a personal interview with all candidates is not feasible. Under such cir-

cumstances it is common practice to require each candidate to submit a letter of application, in which his or her qualifications are set forth and certain personal data recorded. Sometimes a standardized or conventionalized application form is used. More frequently the form and in part the content of the letter is left to the wisdom and discernment of the applicant. Through the inspection of these letters of application many candidates are at once rejected and not further considered. Other letters may lead to more favorable action—the applicants may be requested to call for a personal interview, or may even be judged as suitable on the basis of the letter alone.

An Experimental Test

Our present task is that of examining somewhat more closely than is usually done the judgments of human character that are based on such letters of application. In order to secure representative material for the study, a bona fide advertisement for a bookkeeper and office assistant was inserted in the "help wanted" columns of the Sunday editions of two New York City newspapers. Over one hundred letters of application were received. Each gave, in the applicant's own handwriting, and on stationery individually chosen, the main facts of the applicant's business career, education, experience, and previous employment, and set forth with such clearness as the applicant could command the particular qualifications for the position in question. From this large number of letters twenty-five were chosen at random to serve as material for an experimental investigation.

These letters, each bearing a key number to aid in its identification, were presented to fifty different judges.

One group of judges consisted of business men and women who were constantly being called on, in their actual affairs, to make such judgments. Another group consisted of professional men and women, including a number of psychologists; another group consisted of miscellaneous individuals, students, clerical workers, etc. The judges were instructed to place themselves in the position of a prospective employer and to arrange the twenty-five letters in order of merit, as replies to the given advertisement, with respect, first, to the intelligence; second, the reliability; third, the tact; and finally, the neatness, indicated by the letters. Comparison of these different arrangements will at least reveal the amount of agreement shown by the estimates of different judges. If the disagreement is great, it will be evident that the estimates of a single judge are unreliable. Variability thus serves as an index of validity.

As a further test of the stability of such judgments, ten of the judges were again approached after a month had elapsed and requested to arrange the letters again, for the same traits and from the same point of view as on the previous occasion. This makes it possible to determine how consistent are the estimates passed by a given judge, and how far his estimates vary with lapse of time, change of circumstance, or a shift of mood and disposition. If a given judge passes quite different verdicts on two different occasions, on precisely the same material, it is clear that any one of his judgments is likely to be unreliable. The agreement of different judges and the consistency of given judges thus afford criteria for the evaluation of character estimates based on letters of application.

Experimental Results

The estimates, some of them repeated, by fifty judges, on twenty-five letters, of four different traits, give a mass of figures entirely too unwieldy to repeat here.¹ We shall choose for presentation typical results by taking from

ESTIMATES OF TEN LETTERS BY TEN JUDGES

Intelligence

Judge	A	B	C	D	E	F	G	H	I	J
I.....	6	24	13	20	5	3	14	19	12	11
II.....	13	15	6	2	5	16	14	17	12	18
III.....	2	17	5	22	9	6	13	21	23	14
IV.....	11	22	18	13	19	8	20	25	9	16
V.....	9	25	19	20	3	5	18	13	16	14
VI.....	17	14	25	12	22	3	5	21	20	19
VII.....	3	5	9	7	13	1	10	24	15	11
VIII.....	4	14	12	17	6	10	13	16	21	22
IX.....	11	4	7	18	16	3	5	17	19	23
X.....	3	20	9	19	5	8	22	17	18	16

Tact

Judge	A	B	C	D	E	F	G	H	I	J
I.....	10	24	21	14	7	4	23	11	13	19
II.....	17	6	4	5	2	16	24	25	7	19
III.....	2	23	3	22	4	11	17	16	21	13
IV.....	23	18	25	16	3	7	10	13	15	22
V.....	10	11	21	19	13	4	12	2	22	5
VI.....	13	20	10	16	11	5	2	18	17	23
VII.....	5	9	3	10	4	1	6	22	14	23
VIII.....	4	5	12	13	6	10	14	16	21	22
IX.....	10	4	7	18	16	3	5	22	25	21
X.....	16	1	2	14	20	17	21	7	15	13

¹The complete data have been recorded by Lillian C. Walton, who conducted this investigation, in her Master's essay, entitled "A Study of Judgments of Letters of Application," on file in the library of Columbia University.

Reliability

Judge	A	B	C	D	E	F	G	H	I	J
I.....	6	16	7	19	14	3	5	18	11	21
II.....	17	6	5	9	7	19	24	25	3	21
III.....	9	18	4	21	16	12	17	11	7	23
IV.....	17	18	24	23	1	15	16	25	4	10
V.....	19	20	2	14	12	17	21	1	3	4
VI.....	12	17	9	19	11	2	4	21	15	23
VII.....	5	13	25	6	8	1	2	21	14	12
VIII.....	4	14	12	17	6	10	13	16	21	22
IX.....	11	4	7	18	16	3	5	17	19	21
X.....	5	20	14	18	19	2	15	11	12	7

Neatness

Judge	A	B	C	D	E	F	G	H	I	J
I.....	7	22	14	21	11	15	4	16	9	20
II.....	13	21	5	22	12	14	24	18	3	17
III.....	1	20	3	24	5	7	16	17	8	14
IV.....	11	25	18	14	8	17	15	16	6	23
V.....	13	25	6	22	2	9	10	7	20	21
VI.....	8	13	5	23	7	10	3	19	15	24
VII.....	11	13	7	21	6	2	9	8	3	23
VIII.....	4	13	12	16	6	10	14	17	21	22
IX.....	10	4	7	18	16	3	5	17	19	23
X.....	9	22	14	18	5	8	20	15	7	17

the complete tables the estimates of the first ten judges for ten of the letters, using always the same judges and the same letters. The position given a single letter may be anywhere from 1 to 25, position 1 being the best for the trait in question, and 25 being the poorest.

Interpretations

These tables, although they do not show the whole range of variation in the judgments, are sufficient to suggest that this variability is almost as great as it could

possibly be. In the case of Neatness, for example, the letter marked *A* for purposes of identification was given the highest place (1), the lowest place (25), and also occupied positions all along the scale, from the best to poorest. Letter *B* was placed as high as position 4, as low as position 25, and was assigned positions all along the scale by various judges. Letter *C* ranged from second to twenty-fifth place, and most of the other letters produced similarly scattering verdicts. This is true for neatness, in spite of the fact that it is in judging this trait that the different judges agreed most closely.

If the letters had been arranged in purely chance orders they would have had much the same average position and each letter would tend to occupy each position in the scale equally often with all other letters and all other positions. And the chance deviation of the various positions from this average would be a little over six steps. Under the circumstances of the experiment the arrangements made by the various judges approach very closely to chance series. The average deviations of the letters from their own average positions are for neatness 4.83 steps, for intelligence 5.52 steps, for reliability 5.82 steps, and for tact 6.23 steps. Only neatness and intelligence show agreement that is at all certainly closer than that which chance shufflings of the letters would have produced. Even here the tables show that the letter that one judge would have carefully filed for future reference in a personal interview with the applicant, another judge would without further consideration have thrown into the waste basket. Certainly a method that results in such disagreement cannot be justified merely on the grounds of its simplicity, cheapness, and antiquity. Its use results

in manifest unfairness both to the judge and to the applicant.

The facts are still more striking when we consider the consistency with which the same judge reacts on different occasions, although judging precisely the same letters, after having in the main forgotten his previous verdicts. Here we may make use of a method of measuring resemblance through statistical formulæ. Mathematical treatment of the figures can be made to yield coefficients of similarity between two such arrangements of materials. Purely chance agreement will on this basis yield a coefficient of .00. Complete agreement will give a coefficient of $+1.00$, and completely reversed arrangements will give -1.00 . The various degrees of similarity or difference will give coefficients ranging anywhere from $+1.00$ through .00 to -1.00 . Thus a coefficient of $+.50$ would represent resemblance of two series part way between perfect similarity and purely chance agreement. These measures may be given a more concrete meaning by reference to the resemblances of people. Children of the same family resemble each other in physical appearance more than do children chosen at random. And twins resemble each other still more closely than do brothers or sisters who are not twins. Studies have been made in which children have been measured in various physical characteristics, and the degree of resemblance stated in just such coefficients of similarity as those we have described. When this is done it is found that children of the same family give coefficients of resemblance of about $+.40$. Twins, however, give coefficients of about $+.80$. We may then say, by way of concrete illustration, that judgments that agree with each other by a coefficient of .40 are as simi-

lar as children of the same family, while judgments that give coefficients of similarity as great as .80 are as alike as twins.

CORRELATION TECHNIQUE

Readers unfamiliar with the detailed methods used in such computations will find them described in any modern text on statistical procedures. There will be frequent reference to coefficients of correlation throughout the following pages, because of the convenience of mathematical expression. Hence it will be well to have at least a clear notion of the concept of simple correlation. The coefficient states the amount of correspondence between two arrays of measures. A brief illustration will be presented here.

Suppose that twenty people have been arranged in rank order, according to their possession of (1) courage and (2) kindness. In the following table their relative positions are indicated by the numbers opposite the letter standing for each. The two orders (for the two traits) may have any degree of resemblance. Various formulae are provided by statisticians, which enable us to state the degree of correspondence.

Since we have only ranks, not absolute measures, we may use the "rank order" formula, which is

$$r = 1.00 - \frac{6Sd^2}{n(n^2-1)}$$

In this formula r stands for the coefficient of correlation for which we are in search; d is the difference between the positions assigned each individual in the respective traits; S means the sum (of these differences

when each has been squared); n means the number of cases, which is here 20, the number of persons. When these substitutions are made and the equation solved, the result will be the measure of resemblance, which will lie somewhere between 1.00 and -1.00 , as explained in the text. The calculations are carried out alongside the table.

CALCULATION OF CORRELATION

Person	Rank for		d	d^2	
	Courage	Kindliness			
A	2	5	3	9	When the several values under d^2 are added their sum is 376. This multiplied by 6, according to the formula, gives 2256. The denominator of the fraction, since there are 20 cases, is 7980, which is 20 times 399, which is the square of 20, minus 1. Dividing 2256 by 7980 gives .28, which is to be subtracted from 1.00, thus giving us .72, the measure of correlation between the two arrangements.
B	5	1	4	16	
C	10	13	3	9	
D	1	4	3	9	
E	7	6	1	1	
F	11	8	3	9	
G	14	10	4	16	
H	20	15	5	25	
I	16	12	4	16	
J	4	2	2	4	
K	8	14	6	36	
L	3	3	0	0	
M	12	20	8	64	
N	15	11	4	16	
O	17	18	1	1	
P	9	7	2	4	
Q	6	17	11	121	
R	13	9	4	16	
S	18	16	2	4	
T	19	19	0	0	

CORRELATION RESULTS

The following table gives the coefficients of correlation in the case of the ten judges who arranged the letters on two different occasions. These correlations measure the consistency of the two trials.

COEFFICIENTS OF CORRELATION

Judge	Intelligence	Tact	Reliability	Neatness	Average
2.....	.59	.40	.50	.67	.54
3.....	.72	.72	.73	.72	.72
18.....	.08	.40	.27	.38	.28
5.....	.72	.44	.65	.88	.67
20.....	.60	.63	.20	.44	.47
39.....	.31	.18	.23	-.14	.21
7.....	.44	.52	.46	.92	.60
6.....	.62	.31	.45	.51	.47
15.....	.65	.71	.73	.91	.75
1.....	.63	.42	.52	.71	.57
Medians ..	.61	.43	.48	.69	.55

The results show clearly that two such arrangements on different occasions are far from being as similar as twins. Neatness and Intelligence give the most consistent results, the median coefficients being $+.69$ and $+.61$. Tact and Reliability give median coefficients of $+.43$ and $+.48$, just about as much similarity as exists between children of the same family in general. If these coefficients had shown such resemblance as one finds between twins, the judgments might very well have been considered stable and characteristic of the various judges. But such coefficients as we actually secured indicate that on the whole a given judge does not resemble himself any more than he resembles other judges. And we have already had occasion to see what diverse results can come from shifting from the verdict of one judge to that of another.

The table further shows that some judges are more consistent in their ratings than are others. Thus judges 3, 5, and 15 have fairly high coefficients for all the traits,

their different arrangements being almost as similar as twins. Judges 18 and 39 on the other hand have very low coefficients of consistency, and indeed judge 39 in the case of Neatness tends toward verdicts that are the reverse of those of his earlier arrangement, thus giving a negative coefficient ($-.14$).

In much the same way, if we take as our standard the average arrangement of all the judges, their combined opinion, and compare each judge's arrangements with this standard, we find that some judges are more in accord with the group average than are others. Some judges agree closely with this standard in all of the traits. Some differ from it markedly in all traits. The majority, however, agree with the standard to various degrees in the case of the different traits. There is so much disagreement on the whole that it is quite impossible to pick out any one of the judges as a "general expert," that is, one who in judging all of the traits gives arrangements that approximate very closely to the consensus of opinion of all the judges. Nor do the business men and women, who have had experience in passing on such letters agree any more closely with this consensus of opinion than do the psychologists or the miscellaneous individuals.

RELATED EXPERIMENTS

A study of twenty-five letters of application has been reported by Poffenberger and Vartanian,² which confirms many of the results we have just considered. The letters were written by seniors in a training school for religious workers, as applications for a position in the kind of

² Poffenberger and Vartanian, "The Letter of Application in Vocational Selection," *Journal of Applied Psychology*, March, 1922.

work for which they were in preparation. No application form was used, the letters being in the handwriting of the candidates, and giving what each considered to be the relevant or significant details of his characteristics, qualifications, experience, and training.

These letters just as received were given in turn to twelve members of the staff of the Union Theological Seminary with the request that they arrange them according to the degree to which they indicated general fitness for the position.

Criteria for checking up the validity of the judgments of the letters were secured in the following way, as described by the investigators:

Five teachers from the staff of the training school furnished three separate arrangements of the twenty-five individuals according to the degree to which they possessed the three traits, general ability, intelligence and tact. In addition each member of the groups of applicants arranged his twenty-four associates and himself in an order for each of these three traits. The conditions for such estimates were especially good, as the school is small and every teacher has very close association with his students; and the students themselves are more closely associated than are students in the ordinary college.

In this case, although it is not possible to compare the judgments of applications with strictly objective data, they can be compared with judgments based upon actual acquaintance, recorded by teachers and by fellow students. When in each case the group judgment or consensus of opinion is taken as the measure, the following correlations result.

CORRELATION OF GROUP JUDGMENT

Group Judgment of Letters Correlated with	General Ability	Intelli- gence	Tact
(a) Estimates of fellow students . . . .	.46	.44	.18
(b) Estimates of teachers . . . . .	.56	.58	.20
(c) Students and teachers combined . .	.50	.44	.22

In the case of Tact the correlations are so low as to be very unreliable, and it will be remembered that Walton also found both consistency and agreement to be least in the case of that trait. In the case of General Ability and Intelligence, however, the correlations average .50, indicating a very real tendency to agreement between group judgment of letters by strangers, and group estimates of personal traits by acquaintances.

Considering the individual judges of the letters, when the estimates of fellow students are taken as the standard, the average of the individual correlations is .37 in the case of General Ability. The individual correlations range from .18 to .52. When the estimates of teachers are taken as the standard, the individual correlations of the judges range from .24 to .57, averaging .43. That is to say, the group judgment of the letters of applications accords better with the estimates of acquaintances than do the individual judgments, on the average. "Although one might find a judge who would do better than the group judgment, the group judgment would be safer unless one had some means of knowing the good judges beforehand."

IMPROVED TECHNIQUE

Such results do, however, suggest a useful procedure in selecting and in checking up the individuals who are

assigned the work of passing judgment on letters of application, when such applications must be considered. If the consensus of opinion be derived not from the judgments of random individuals, but from a number of members of the firm, alike conversant with the qualities desired, with the definition of trait terms, and with the general policy of the firm, the judicial capacity of each may be determined. This will be shown by the individual's agreement with the consensus of opinion of all the responsible individuals. Deviation from this standard will indicate at least departure from the general aim or policy. Close agreement with the consensus will characterize the executive whose judgments best represent the combined opinions of the firm. In the case we have just considered, judges 3, 5, and 15 are the ones best qualified to represent the group opinion, if we assume that all four of the traits here considered are essential. On the other hand it would be folly to assign the task of rating such applications to judges 18 and 39, whose agreements with the consensus of opinion are so low as to suggest almost purely random decisions, unless it could in some definite way be demonstrated that the policy of the firm or the consensus of opinion were wrong. This could be learned by comparing the early ratings with the subsequent success of such candidates as were employed. Such investigation requires time and patience, as well as considerable experimental and statistical expertness, but such procedure represents the only promising method for giving value and accuracy to judgments based on letters of application, and for choosing employment executives whose opinions, in this connection, will have substantial merit.

A further step with genuine utility consists in taking

care that the application shall contain data of the highest possible relevance. Shall the applicant be required to state: (*a*) his mother's maiden name; (*b*) whether his father is living; (*c*) his reason for leaving school; (*d*) what studies he liked best; (*e*) what church he belongs to; (*f*) whether he plays a musical instrument; (*g*) how many brothers and sisters he has; (*h*) whether he is a vegetarian; (*i*) his pulse rate? All of these are questions that actually occur on application forms. Obviously such an application or letter should contain as much relevant material as possible and as little distracting and irrelevant material. But the preparation of instructions for such applications presupposes that some study has been made of the relation between biographical data and fitness for the job in question. Furthermore, not all relevant biographical facts are equally important for many jobs. In one connection age may handicap while education qualifies; in another connection education may count for little but physiological maturity may count for much.

Judgments based on letters of application may therefore be given added validity if the letters are required to give relevant data and if there is some more or less systematic method of evaluating the relative importance and the total significance of the data reported by the candidate. No precise rules can be laid down for such an enterprise in general, since the value of every item will vary with the circumstances, the job, the firm, and with other items. But for any particular situation investigation will usually disclose valuable principles or tendencies, and often exact quantitative measurements of the value of special items may be secured. The following examples will suggest ways in which added value may

accrue to the traditional method of selection based on letters of application.

Illustrative Cases

The National Association of Life Underwriters recently secured, from 548 successful insurance salesmen, information on some seventy questions, partly of a biographical character. An analysis of these returns has been made by Dr. F. L. Wells.³ The men are grouped according to earning capacity, into four groups which we may roughly characterize as excellent, good, fair, and poor. On the basis of annual earnings they represent \$25,000, \$10,000, \$5,000, and \$2,500 groups. From the numerous items given in the analysis of Wells, those incorporated in the table on the following page are chosen merely to illustrate the difference between relevant, ambiguous, and irrelevant facts.

All of these items represent data that could be secured from a properly prepared application blank or letter. But it is clear that they are not of equal importance, from the point of view of success in the occupation concerned. Thus Time Given to Work, Having Good Health, Motive for Entering Work, Education, Felt Lack of System, and Marital Status, do not vary with earning power or success in this vocation, especially if the very small group of eight "excellent" men be omitted because of the relative unreliability of averages from so small a number of cases. Age, Working as a Boy, Mortgage on House, tend only slightly to be related to success.

On the other hand Having Children, Starting Work on Commission, Having Outside Recreations, Not Feel-

³ F. L. Wells, "Analysis of a Successful Agent," *Life Association News*, Vol. XI, p. 3.

EARNING CAPACITY AND BIOGRAPHICAL DATA

	Excel- lent	Good	Fair	Poor
Number of men in the group.....	8	81	180	279
Average age	46	45	44	41
Percentage of time given to work.	88	77	74	78
Number married (per cent).....	90+	90+	90+	90+
Per cent having children.....	100	82	74	67
Per cent working as a boy.....	50	80	84	85
Per cent starting on commission..	88	86	81	37
Per cent having good health.....	100	97	94	95
Attracted to work by opportunities	50	60	62	60
Entering work, from necessity....	25	6	12	14
High school or seminary education	100	65	68	67
Attended college or technical school	63	27	36	73
Per cent having recreations.....	100	87	82	74
Having mortgage on own house...	13	30	30	39
Feeling lack of perseverance.....	0	1	9	17
Reporting lack of system.....	0	11	2	6

ing Lack of Perseverance are definitely related to success, throughout the table of results. Now if, on general grounds, health, education, marriage, freedom from mortgages, and system are desirable traits in an applicant, it would seem that these traits should at least be given less weight than that assigned to those traits that are definitely related to degree of success. To assign precise weights to various items involves somewhat complicated technic, such as that to be described in a later chapter on the methods of correlation. But an improvement over the random method commonly used would be to assign, say, one point credit to desirable traits not found to be related to success, and two points to traits or items found to be so related. By some such system of point credits an approach to objective ratings of application blanks may be made which

would quite certainly possess a validity not characteristic of judgments based solely on subjective impression.

Andrews⁴ has reported, from the Bureau of Personnel Research of the Carnegie Institute of Technology, a case in practical business in which such a system of grading applications was adopted, after a preliminary study of the relation between various biographical facts and success in the case of individuals already in the employ of the firm. The following quotation illustrates the use of the method.

A man states in his application that he is thirty-five years old. Looking up the range of values for age we find that he gets three points on that item. We note that he is single and we take away a point, leaving two. He has had eight years schooling and we add a point for this, bringing his total thus far back to three. He has been a file clerk, ledger clerk, and head clerk, all of which come under social occupations; we subtract a point from the total. He has, however, remained for years with the same company, which shows that he is a stable worker and not a "floater." This adds a point and his total once more stands at three. After assigning the proper scores to the remainder of the items on his application blank, we finally secure, let us say, a total score of 8. Reference to our table shows that men scoring 8 have practically always made good, so the man is hired.

While such improvements of the traditional method cannot be expected to produce perfect correspondence between selection and success, the evidence is that the careful scrutiny, system, and objective point of view which the method involves constitute a genuine advance in personnel selection. Thus Andrews concludes that "the items

⁴L. G. Andrews, "A Grading System for Picking Men," *Sales Management*, January, 1922.

in an application blank can be graded so that they will pick the right man 60 per cent of the time.”

Similar methods of analysis were used by Thorndike⁵ in his study of the biographical data of applicants for the schools of military aeronautics. Biographical items were compared with the classification of men as successes or failures in the Ground schools, the Flying schools, and in actual service, in the hope of discovering significant antecedents which might aid in the selection of men for training. In this way the most important items were found to be amount of education, rate of school progress, class standing, and interest in and ability at studies of the physical sciences, when success in the ground schools was taken as the criterion. Age, salary at last position, social status (occupation of father) showed no correlation with such success. Such data were by no means used as the sole criteria of selection, but, in so far as the items of the application blank were used at all, they could on this basis be assigned their relative importance and roughly combined to give certain total indications.

A study of life insurance salesmen's qualifications, by Goldsmith,⁶ illustrates the attempt to give quantitative expression and weighting to such facts as may be elicited in the letter of application or the biographical history or record form. A preliminary analysis of the data from the records of good and poor salesmen led to the formulation of a system of weighted credits, based on such biographical data as age, marital status, club membership, sales expe-

⁵*The Personnel System of the United States Army*, Vol. I, pp. 604-633.

⁶D. Goldsmith, "The Use of the Personal History Blank as a Salesmanship Test," *Journal of Applied Psychology*, 1922, Vol. VI, pp. 148-155.

rience, education, previous occupation, conditions of employment, and so on. These various credits were somewhat arbitrary, but accorded in general with the results of analysis. Thus men under 25 and over 50 years of age, as applicants, were found not to succeed so well as applicants in the intermediate ages. Credits and penalties for age were therefore assigned as follows:

<i>Age</i>	<i>Credit</i>
18-20	— 2
21-22	— 1
23-24	0
25-27	— 1
28-29	— 2
30-40	— 3
41-50	— 1
51-60	0
Over 60	— 1

Similarly increasing amounts of school education were found to be favorable for success, up to 12 years. More years spent in education were less favorable. Hence education was scored as follows:

8 years	— 1
10 years	— 2
12 years	— 3
16 years	— 2

Married men, those belonging to a club, engaged in a social occupation, carrying life insurance themselves, and having previous experience selling life insurance, were scored one point favorably on each of these items. The opposite conditions were penalized one point on each count, and so on.

When many insurance salesmen were classified as best, average, and poorest, on the basis of their production of sales, and their scores on the personal history record were computed, the following results were found. The figures show how many of each class of men had application blank scores below 4, between 4 and 8, and over 8, when the credits and penalties on all biographical facts were summated.

CORRELATION BETWEEN PERSONAL HISTORY RECORDS AND PERFORMANCES OF INSURANCE SALESMEN

Ability	Summated Application Form Scores, per cent		
	Below 4	4 to 8	Over 8
Best group	15	41	44
Average group	18	54	28
Poorest group	53	37	10

Over half of the poorest group score less than 4 points, whereas nearly half of the best group score over 8 points. The scores thus derived seem to have a definite relation to later success, and hence may be used to advantage, among other criteria, in the selection of applicants. While some unfairness may be done to individuals, on such a plan, it is at least true that the plan makes for more profitable selection and less waste on the part of the employer. It may even be that the men selected could be better employed at something else, but the insurance company can scarcely be expected to assume responsibility for this. The situation neatly illustrates some of the conflicting points of contact between vocational guidance and

personnel selection. But the facts, of course, are equally important for both enterprises.

In all of these cases, and in general in the use of letters of application, the need is felt for more objective methods of securing information concerning the candidate's character and capacity. Thus an improved rating of applications which secures only 60 per cent of successful selections, leaves much to be desired, and should always be supplemented by whatever additional aids are available.

In the case of the studies of this traditional method of diagnosing character we have few objective facts with which to compare our judgments. It might seem reasonable to suggest that the consensus of opinion of all the judges would approximate such an objective standard. This, however, cannot be assumed until it is demonstrated. It is entirely possible that some judge whose arrangements differ widely from the consensus of opinion is more nearly correct than is that consensus. Even in democratic countries the counting of votes does not necessarily determine truth.

The letter of application often contains a photograph of the applicant. In many cases the candidates are requested to submit such photographs, and cases are even known in which it is announced beforehand that applications not accompanied by photographs will under no circumstances be considered. Presumably these photographs are supposed to reveal evidences of character not to be found in the letters, and since the photograph is usually the next thing to be considered, we may next turn to the judgment of photographs, as our second traditional method of diagnosing character.

CHAPTER V

TRADITIONAL METHODS: II, THE PHOTOGRAPH

EXPRESSIVE FEATURES

That character reveals itself in the features, and especially in the facial expression, is a belief of long standing and of quite general tenure. Even those who have long relinquished their faith in phrenology and physiognomy, with their attempts to tabulate the meaning of structural characteristics, believe that customary attitudes and feelings may be read from the total impression given by the face. A face or photograph, it is said, "looks intelligent," "beams with pride," "speaks defiance." Even the faces of the lower animals convey these meanings to us. Sometimes particular details are singled out as significant, but this is usually a rationalization, made after the general impression has already been given. Again the face is said to remind one of someone else who had given characteristics, as a result of which the trait is attributed to the stranger. But, aside from the arbitrary dogmas of particular professional "characterologists," there is no general agreement on these details, either as between individuals or as between different photographs or faces.

EXPERIMENTAL TESTS

In spite of the disagreement on significant details, there is nevertheless considerable agreement between the verdicts

which different people pass on the character denoted by photographs. A group of ten adults were asked individually to arrange a series of twenty photographs in an order of merit on the basis of several different traits of character. If there were no agreement among the judges, their arrangements would follow the laws of chance, and each photograph might be expected to appear equally often in any of the positions from one to twenty in the series. All the photographs would have about the same average position, which would be about rank number ten, and the average deviations of the verdicts of the various judges would be about five positions for each of the photographs, regardless of the trait in question. Different judges show quite striking agreement in their estimates of the characteristics suggested by a given photograph. Thus, if the average position assigned to each photograph be taken as the standard and the divergences of the ten judges from this standard be averaged in the case of all the photographs, the average divergencies for the different traits are as follows:¹

¹To make clear the way in which these figures are secured, and to show concretely what they mean, suppose that the twenty photographs are lettered A, B, C, D, etc. They are to be arranged in an order by each judge according to his judgment of the intelligence of the individuals, the individuals being unknown to the judges. Suppose that the ten judges place photograph A respectively in the following positions: 9, 11, 5, 8, 9, 12, 7, 8, 7, 14. The average of these ten positions is 9, which we then take as the standard or most probable position of photograph A. Only two of the judges actually place A in the ninth position. The other eight judges all vary more or less from this position. We then find how much each judge varies from the average of the group, and the ten variations are respectively 0, 2, 4, 1, 0, 3, 2, 1, 2, 5 positions. The average of these individual variations is 2.0 positions. This figure indicates how closely the ten judges agree in their estimates of photograph A, a small average deviation indicating close agreement. In this way we find for each of the twenty photographs its average deviation; and if the twenty figures thus secured are in their turn averaged we secure an approximate

AVERAGE DEVIATIONS IN JUDGING PHOTOGRAPHS

Trait Judged	Average Deviation	Chance Deviation
Intelligence	2.86 places	About 5 places
Perseverance	3.32 "	" " "
Kindliness	3.55 "	" " "
Conceit	3.57 "	" " "
Courage	3.69 "	" " "
Humor	3.90 "	" " "
Deceitfulness	4.14 "	" " "

This means that in the long run one judge will place a photograph in a group of twenty, when arranged for a given trait, not over three or four steps away from the place to which others would assign it, instead of the five steps which chance arrangement would yield. This tendency toward more than chance agreement also varies with the trait. It is highest of all for intelligence and perseverance, lowest of all for humor and deceitfulness, and intermediate for the other traits here considered. In the case of humor and deceitfulness, indeed, the disagreement is almost as great as chance would produce, although in the case of intelligence the deviation is only a little more than half as great as would result from chance. These results suggest, then, that quite aside from the correctness of their opinions, people agree fairly well on the facial expression that denotes intelligence, but that each has his own notion of the appearance of a deceitful face.

The individual's physiognomy, however little it may measure of the disagreement of the judges when estimating the intelligence suggested by the photographs. Similarly we may compute average deviations for any other trait which is judged. These final figures are the ones which are given in the table, each of them being the average of twenty photographs, as judged by ten persons.

actually reveal of his personality, nevertheless suggests rather definite characteristics to those whom he meets, and to that degree determines their reaction toward him, expectations of him, and belief in him. It is psychologically as interesting to inquire just what impressions people actually receive from one's physiognomy and expression, as it is to ask whether these impressions are correct. One's ultimate vocational accomplishment often depends on the first impression he creates, the type of reception his appearance invites, even though there may be no necessary connection whatever between appearance and mental constitution. Vocational success depends not only on the traits one really possesses, but also somewhat on the traits one is believed to possess.

AGREEMENT WITH FACTS

The practical question is of course not how closely different judges agree in their estimates of photographs, but whether these verdicts bear any relation whatever to the facts. Fortunately this investigation and several others similar to it give us interesting information on this point. Is there "an art to read the mind's construction" in the photograph? The individuals whose photographs were used were ranked in order of merit for various traits by twenty-five people who were acquainted with all the individuals. These rankings were not based on photographs nor on features, but on actual experience with the people in question through a close acquaintance for a period in no case less than two years. Since human traits exist only in so far as they become manifest, we may fairly take the combined judgment of these twenty-five acquaintances to represent as correct a statement of the real characters as can

conveniently be secured. To have been known by twenty-five associates for at least two years is, in a sense, equivalent to fifty years of acquaintance with one individual, and traits that do not manifest themselves correctly and frequently in fifty experience years are not likely ever to do so.

The question proposed was: "What relation exists between the judgments which strangers form, on the basis of an individual's photograph, and the judgments which acquaintances make on the basis of daily familiarity and long observation?"

All the members of a group of college women were judged by twenty-four of their associates, for a number of more or less definite characteristics. The twenty-five individuals constituting the group were arranged in an order of merit for each trait, by each of the twenty-four judges. Only one arrangement, for one trait, was made by any one judge within a given week. The judgments were thus distributed over a considerable interval so that judgments for one trait might influence as slightly as possible the judgments of later traits. All these twenty-four judgments were then averaged for each trait, and the final position of each person in each trait thus determined by the consensus of opinion of the judges. This measure is then a combined estimate on the basis of actual conduct and behavior.

Photographs of all the members of the group were then secured, all of them taken by the same photographer, in the same style and size. These photographs were now judged, by a group of twenty-five men and a group of twenty-five women, all of whom were *totally unacquainted* with the individuals who were being judged. These stran-

gers arranged the photographs in order of merit for the various traits of character, just as the earlier group of judges had arranged the names of the members of the group, with all of whom they were acquainted. The various arrangements of the photographs were then averaged, yielding for each photograph an average position in each trait. We thus have three measures of the group of college women: (1) the judgments of their intimate associates; (2) the judgments of twenty-five men, on the basis of the photographs, and (3) the judgments of twenty-five women, on the basis of photographs. All of these measures may be compared one with another, and correlated so as to show their respective amounts of correspondence. We shall be especially interested in the validity of individual judgments and in the result of combining individual judgments into a consensus of group opinion.

UNRELIABILITY OF INDIVIDUAL JUDGMENT

We can now compare the judgments of photographs, made by total strangers to the individuals represented, with the combined judgments of these twenty-four acquaintances. The comparison should tell us something fairly definite concerning the validity of judgments based on photographs by the method of general impression. If we represent a mere chance agreement, such as would be produced by shuffling the photographs repeatedly and averaging the rankings given after each shuffling, by zero (.00), we can by the appropriate statistical procedure, referred to in the preceding chapter, determine the degree of resemblance due to the correctness of the judges in their estimates. A resemblance of 1.00 would be perfect agreement between the ranking of the photographs and the

combined verdict of the acquaintances. We might in this way secure coefficients of agreement lying anywhere along the scale from zero to perfection, that is from .00 to 1.00. We might even find negative relations, giving us such coefficients as $-.24$, $-.48$, etc., or even -1.00 in case one series should be absolutely the reverse of the other. We find both positive and negative correlations.

The following table shows what coefficients of agreement resulted from the comparison of the verdicts of ten judges who arranged the photographs, with what we have described as the true or actual ranking of the people represented. The coefficients are given for all the judges in the case of three representative traits.

INDIVIDUAL CORRECTNESS OF JUDGES

Judge	Intelligence	Neatness	Sociability
I.....	.51	.11	.39
II.....	.11	.10	.08
III.....	.15	.29	.05
IV.....	— .27	.06	.49
V.....	.08	.24	.08
VI.....	.43	.41	.28
VII.....	.04	.11	.02
VIII.....	.39	— .09	.32
IX.....	.22	— .08	.00
X.....	.30	.02	.55
Medians .....	.19	.11	.18

The results are very instructive. The individuals judging the photographs tend slightly toward correctness rather than toward error, but the individual coefficients of agreement are so low and so irregular as to be entirely useless. Verdicts of one judge, based on the photographs, are so inaccurate that on the average they give only a little

more than chance agreement with the facts, and if one is going to rely on the verdict of a single judge, one might almost as well request him to shuffle the photographs and report which one comes out on top. Moreover, when one judge happens to yield a fairly high coefficient in judging one of the traits, he is entirely likely to fall very low in his judgment of other traits. And, as a matter of fact, in three cases in the table the individual judgments of the photographs gave negative coefficients with the true orders. Obviously, to accept the verdict of one judge would be unfair to the individual whose fate might be in question, as well as unfair to the judge compelled to assume this responsibility.

THE CONSENSUS OF OPINION

But this does not necessarily mean that photographs tell us nothing about human character. As the table shows, the individual judges tend toward correctness rather than toward error. We might suppose that by combining the verdicts of many judges, as we did in the case of the acquaintances, we might secure more accurate results, since the errors of one judge might tend to neutralize those of another, thus precipitating only their mutual correctness as the final result of the combination. That such a hope is in part justified is shown by the following table of results, which were secured by averaging the opinions of twenty-five women, in the one case, and twenty-five men in the other, when both were judging the character suggested by twenty-five photographs of women. Here as in the previous case we have compared the judgment of the photographs with the combined estimates of twenty-four acquaintances.

JUDGMENTS OF PHOTOGRAPHS COMPARED WITH JUDGMENTS MADE
BY TWENTY-FOUR ACTUAL ACQUAINTANCES

Trait	Photographs Judged by 25 Men	Photographs Judged by 25 Women	Average of Men and Women
Neatness .....	.03	.07	.05
Conceit .....	.10	.27	.19
Sociability .....	.29	.29	.29
Humor .....	.21	.45	.33
Likeability .....	.30	.45	.38
Intelligence .....	.42	.61	.51
Refinement .....	.50	.52	.51
Beauty .....	.60	.49	.55
Snobbishness .....	.58	.53	.56
Vulgarity .....	.61	.69	.65
Medians .....	.36	.47	.45

Considering the average results it appears that by combining the verdicts of several judges the accuracy of the judgments based on photographs is increased. The individual judges intelligence with a correctness of only .19 on the average; the group judges intelligence with an average correctness of .51. In the case of sociability, also, group correctness is greater. The individual, however, judged neatness, on the average, with a correctness of only .11, whereas the group judges it with no greater correctness. In the case of the other traits the correctness of the group judgment varies with the trait considered. Neatness, conceit, sociability, humor, and likeability give very low coefficients even when the group judgments are used. But intelligence, refinement, beauty, snobbishness, and vulgarity yield coefficients sufficiently high to be interesting and suggestive.

Another point to be noted is that even under these

circumstances the coefficients are far from perfect, even for those traits in which they are the highest. Only if beauty, snobbishness, or vulgarity are the traits which are crucial, are judgments of the photographs reliable enough to be worth considering. It would appear that the vocations which depend markedly on these characteristics are exceedingly few. And even here, although the reliance on coefficients of .55 might in all probability aid the employer in decreasing the percentage of the snobbish or the vulgar among his employees, grave injustice would most certainly be done to those many individuals who constitute exceptions and keep the correlations from being perfect. Only when correlation coefficients are very high can their indications be applied in the guidance of individuals—as distinguished from the selection of groups—with safety and justice. Just how high they should be is a technical statistical problem.

In general then the investigations here considered suggest that photographs may be used to convey useful information concerning the character of the individuals they represent, if the proper technique is employed. The technique consists, first, in securing the combined estimates of many general impressions, and second, in recognizing that such combined impressions give significant coefficients of correctness only in the case of certain traits. Many different investigations agree in finding that the traditional methods of diagnosing human aptitude and character give, in general, coefficients of correctness of not over .25. It is then useful to know that, at least in the case of certain traits, the method of the combined impression from photographs gives coefficients of correctness that are at least twice as great (.51 to .65 in the present instances)

as those resulting from the traditional methods in their usual form.

ADDITIONAL EVIDENCE

Since this investigation was made, several other studies similar to it have been reported by other workers in this field. Pintner² used rather dissimilar photographs of children whose intelligence he had measured by one of the standard intelligence scales, and had the photographs ranked for intelligence by various judges. Just as in our own case, the individual judgments tended toward correctness, but the coefficients of correlation were small. They averaged only about .10 when individual judgments were considered, rising to .16 when the judgments of the total group of observers were combined into a group impression. In another case³ the employees of a company were given standard intelligence tests, and their photographs were judged for intelligence by twelve people, who were unacquainted with the individuals represented. A special method was used which does not give figures precisely comparable with those reported above, but the indications are very much the same as those from other investigations. By the method used, the combined judgments give a correlation of .27 with the intelligence ratings as secured through the tests.

The main experiments presented in this chapter were duplicated by McCabe, working with Hull.⁴ Such repetition of experiments is a very important step in science,

²"Intelligence as Estimated from Photographs," *Psychological Review*, July, 1918.

³L. D. Anderson, "Estimating Intelligence by Means of Printed Photographs," *Journal of Applied Psychology*, June, 1921.

⁴C. L. Hull, *Aptitude Testing* (World Book Co., Yonkers, N. Y., 1928), pp. 114-119.

for it confirms previous results, when the findings agree, and raises questions calling for further study, when they disagree. In this instance the findings were very similar. It was shown again that "whether there is any validity to character judgments based merely on photographs, there certainly is considerable unanimity in such impressions." When the judgments of photographs were pooled and compared with the estimates of acquaintances, the correlations were small, but only one was negative. As in the study reported in this chapter, neatness, conceit, sociability, humor, and likeability yielded quite insignificant correlations. Beauty, intelligence, and snobbishness gave the highest correlations, in magnitude not unlike those we have reported. The only real exceptions were refinement and vulgarity, which gave lower coefficients than those we have found. Hull, in reporting these results concludes: "The results as a whole certainly look very bad for the judgment of character on the basis of photographs."

In the case of this traditional method, then, our results, though critical, are not entirely disparaging. The scientific study of the traditional methods is not undertaken with the hope of bringing them into disrepute. The intention is instead that of investigating, by controlled experiment, the degree of value attaching to these methods and the conditions under which greater value can be secured. Nor should our study be influenced by the practicability or impracticability of securing in actual affairs these more favorable conditions. We must first know what the favorable conditions are and in what respects the method in question yields reliable information. The continued use of the method then becomes a question of practical expediency.

CHAPTER VI

TRADITIONAL METHODS: III, SELF-ANALYSIS

We have now reviewed the vocational efforts of primitive magic, medieval clairvoyance, phrenology, physiognomics, industrial education, the vocational survey, the letter of application and personal history blank, and the use of photographs. We have three further traditional methods available for the purposes of vocational psychology—that of self-analysis, that of the recommendation or opinion of associates, and that of the personal interview. We shall then consider the vocational significance of the school record, after which the discussion will deal with more modern objective methods, such as the use of various standardized tests, with the array of special vocational test procedures, with psychographic technique, and with job analysis.

In the absence of more reliable ways of determining the capacities, interests, and vocational aptitudes of individuals in the past, and whenever there was any question of selection, fitness, or choice, four vague methods have often been followed: (1) Either the individual undertook the first available type of employment, tried it out, and then persevered in it or abandoned it for a trial at some other type of work until a suitable occupation was found; or (2) he continued at the original work and made the most of the results and of the ensuing satisfactions or dissatisfactions; or (3) he felt more or less

clearly drawn to some particular occupation because of a keen interest in it or because he believed himself to be particularly likely to succeed in it because of his own analysis of his aptitude and characteristics; or (4) he consulted friends and associates, asking them to advise him on the basis of their impression of his individuality and powers.

The unsatisfactoriness, waste, and misery of the first two of these methods are largely responsible for the development of a conscious attempt at the vocational guidance of youth. Perhaps if more use were made of the two remaining methods we should never have been moved to initiate the laborious work called for by the psychographic and the test methods. Not enough critical attention has been given to the methods of self-analysis and to the validity of the judgments passed on us by our associates. The difficulty encountered when one seeks for information on such questions as the following indicates the desirability of further and closer study of these matters.

PROBLEMS IN SELF-ANALYSIS

1. In the individual's analysis of his own personality, are formal guidance and method needed, is special terminology useful, and the recorded experience of others an aid?

2. If so, what sort of guide or scheme or system may such self-analysis profitably follow?

3. Have such guides to the introspective analysis of the self been formulated, and by whom, where, and when?

4. How reliable and consistent are an individual's judgments of his own characteristics, interests, and aptitudes? Has one any constant tendency to overestimate or underestimate himself?

5. Do the degree of reliability and consistency, and this

constant error vary in any way with the individual, with the circumstances, and with the particular trait that is being estimated?

6. How is the individual's judgment of himself likely to compare with the impression of him which his associates form? To what degree does this vary with the individual, the trait, and the associates?

7. What relation exists between the individual's opinion of himself and the results of objective measurements of him, such as those afforded by psychological tests?

8. Are individuals who themselves possess a given trait in high degree better judges of that trait in themselves or in others than are those who possess the trait in less degree?

9. What intercorrelations exist between the estimates of self and others, when different traits are compared?

On the first three of these questions the following sections indicate such material as is available, pointing out where the more valuable and detailed information may be found. On the remaining questions recorded information is much rarer. Here we shall summarize the available material and shall also present answers based on an original investigation.

There is perhaps no proof required that complete and systematic self-analysis is more desirable than random and undirected introspections, whatever value may be attached to the results of such analysis. Whatever be the purpose of self-analysis, it will be the more useful and suggestive the more completely it compasses the total range of capacities and inclinations. Comparison of different analyses by different individuals should result in a synthesis of traits, an acceptable terminology, and a mode of statement better calculated to throw light on individual equipment than is secured by the methods of casual and

unguided rumination. So far as possible such analyses should proceed in terms of identifiable, comparable, and measurable characteristics rather than by the vague categories of conversation and literary description. Such categories, traits, and terminology should be used as will best enable the individual not only to state his own reactions in figures of speech, but also to compare himself with his immediate associates and with characters less directly known.

ANALYSIS OUTLINES

One of the first attempts to draw up a list of fundamental qualities as an aid in the inventory of a given individual's particular nature was made by Cattell in an article concerning the characteristics of men of science. Twenty-four traits are enumerated, as follows:

Physical health	Reasonableness
Mental balance	Clearness
Intellect	Independence
Emotions	Coöperativeness
Will	Unselfishness
Quickness	Kindliness
Intensity	Cheerfulness
Breadth	Refinement
Energy	Integrity
Judgment	Courage
Originality	Efficiency
Perseverance	Leadership

Of this list Thorndike has written:

These elements of manhood or components in mental structure hail from a mixture of psychological theory and general reflection on human behavior. It is regrettable that the list has not been published more widely and used in a variety

of connections. It seems probable that these significant nouns may in many cases be paralleled by natural units of mental organization-atoms in the human compound. I venture to suggest also, as at least a provisional principle of organization, the instincts or original tendencies of man as a species, it being my opinion that some of the terms of the above list refer to rather complex concatenations of traits in man's nature which have only the artificial unity of producing some defined result in human life.

Partridge, in his *Outline of Individual Study*, gives an account of methods whereby the teacher may assist the young child in discovering his or her particular physical and mental constitution. The book contains a brief outline for such study and enumerates many pages of words descriptive of human nature. The main aspects of the mental life of children are taken up in successive chapters and discussed in a general way, with suggestions in the way of tests, problems, questions, points of observation, etc.

The *Family History Book* (Bulletin No. 7) of the Eugenics Record Office contains a scheme, arranged by Drs. Hoch and Amsden, for the examination of the personality of persons suspected of mental abnormality. This scheme is further elaborated by Wells in an outline to be referred to at a later point in this chapter. In the *Trait Book* (Bulletin No. 6) of this same office, there is to be found a long list of traits descriptive of human beings, including physical and physiological as well as nervous and mental characteristics. These traits are classified for convenient reference and record according to a decimal key. The pamphlet also contains classified lists of diseases, crimes, and occupations. Various other bulle-

tins issued by the Eugenics Record Office will also be found both interesting and suggestive to those interested in the study of self-analysis, heredity, and individual differences. They contain nothing, however, of immediate vocational applicability.

Dr. F. L. Wells has made a comparative study and synthesis of the schemes proposed by Cattell, Hoch and Amsden, Heymans and Wiersma, and Davenport, supplementing these at certain points and suggesting a method of giving more or less quantitative form to the characterizations. It is obvious that an outline of this sort can be used in expressing the personality of another individual as well as for the purposes of self-analysis. Such an outline is of value not only for general knowledge or for vocational study but also in the examination into questions of mental health, pathological tendencies and trends, predispositions leading to or favoring mental instability, etc. Wells describes fourteen phases or aspects of human personality, and under each phase presents guiding questions, suggestive clues, and subfeatures. Especially convenient and helpful is the method of giving an approximate quantitative statement which facilitates comparison and summation. Suitable marks assigned to the several different characteristics under each of the fourteen main headings (there are in all about ninety-five subtraits) serve to indicate marked, distinct, or doubtful presence, or marked, distinct, or doubtful deficiency or aversion.

The main headings given by Wells are as follows:

1. Intellectual processes (5 subtopics)
2. Output of energy (4 subtopics)
3. Self-assertion (7 subtopics)
4. Adaptability (5 subtopics)

5. General habits of work (5 subtopics)
6. Moral sphere (6 subtopics)
7. Recreative activities (16 subtopics)
8. General cast of mood (3 subtopics)
9. Attitude toward self (4 subtopics)
10. Attitude toward others (7 subtopics)
11. Reactions to attitude toward self and others (12 subtopics)
12. Position towards reality (5 subtopics)
13. Sexual sphere (9 subtopics)
14. Balancing factors (6 subtopics)

The complete outline, accompanied by much suggestive discussion and comment on the constitution, development, and types of human personality, is published in the issue of the *Psychological Review* for July, 1914. It should be carefully read by all interested in this type of individual analysis.

One of the most carefully planned, easily available, and concretely serviceable outlines for self-analysis is that formulated and published by Yerkes and LaRue¹ under the title *Outline of a Study of the Self*. The authors of this outline have found that a study of ancestry, development, and present constitution is an extremely profitable task. They present this guide as an aid to such systematic and thorough study. The purpose of such study is three-fold: (1) To help the individual understand himself or herself; (2) to help the individual understand and sympathize with others; (3) to arouse interest in the study of heredity, environmental influences, eugenics, and euthenics.

The *Outline* is put together on the looseleaf system, with blank pages for records and replies. Under the heading "Ancestral History of the Self" are given the "Record

¹Harvard University Press, Cambridge, Mass., 1914.

of Family Traits" of the Eugenics Record Office, and many supplementary questions concerning physical, mental, moral, and social traits of near relatives, with suggestions as to their classification and evaluation. Under "Development or Growth of the Self" and "The Self of Today" the prenatal, infantile, childhood and adolescent periods, and the present time are each provided with questions concerning characteristics, influences, growth, temperament, inclinations, habits, capacities, and social relations. Under "The Significance of the Characteristics of the Self" are given questions concerning vocational demands, equipment, and ambitions; marital propensities and fitness; responsibilities and preparation for parenthood; and the "Index to the Germ Plasm" of the Eugenics Record Office is considered. A final section invites reflection on "The Duties of the Self as a Member of Social Groups" in the light of physical and mental constitution, moral and religious tendencies, vocational abilities, and marital and parental relations and duties. The attempt to use this outline will be found instructive.

In a *Manual for Vocational Success* developed and published by him, H. W. Hepner has outlined an elaborate scheme of self-analysis, with respect to occupations and people. The individual is supposed to be able to rate himself adequately on a large array of traits, and various kinds of work are described in terms of the supposed traits for which they qualify the individual. Various general and sensible "rules for success" are also offered, hints on letters of application, and similar suggestions. The analyses and descriptions are all on an a priori basis, but such a scheme has a certain interest for those who wish to undertake a somewhat systematic attempt at self-

appraisal, as a means of organizing their knowledge and opinions of themselves, without any very valid check or control on their validity.

Dr. Douglas Fryer, in a volume on *Vocational Self-Guidance*² outlines methods for self-analysis by a personal rating scale method, and presents chapters on various vocations written by specialists in the various fields. The traits considered are fewer in number than in the very long list proposed by Hepner, and an intelligence test for self-measurement is also included. There are also useful chapters on getting a job, the technique of application, and similar topics.

Such attempts to present suggestive outlines for self-analysis or for the inventory of the traits of others are both commendable and timely. That they are but beginnings in the right direction their authors commonly recognize. Their supporting idea is not that employers, teachers, or physicians should take the individual's replies to these questions as embodying information which the individual did not previously know about himself. The individual, in attempting to express and analyze his inclinations and reactions, may find them clarified and ordered in the process. He is likely to discover at an early point in his record how little he is really able to say about himself with assurance. If this should induce a humility which leads him to more careful self-scrutiny, such value as this subjective stock-taking may have will surely tend to be enhanced. Experimental studies such as those next to be reported reveal many sources of error in the judging of one's own characteristics which should always be held in mind.

² J. B. Lippincott Co., Philadelphia, 1925.

JUDGING ONE'S OWN CHARACTERISTICS

The letter of application has certain characteristics of its own, by virtue of its being a letter—its form and appearance, its vocabulary and general tone, its stationery, its choice of topics and their relative emphasis. The letter may also be accompanied by a photograph of the writer. Both of these features, the letter as a whole and the photograph, we have considered in detail. Special attention, however, must be given to a kind of material which may appear in some letters but not in others, and concerning which special provision is made in many formal application blanks. Distinguished from the narrative of fact and biography, we must recognize those estimates which the applicant gives of his own mental or moral traits, his aptitudes, virtues, and interests—in general, his self-estimates.

In an application blank issued by a public employment bureau, which advertises "Facilities for supplying high-grade skilled and unskilled male and female help promptly," the applicant is advised, "Your answers to all questions will serve as a guide for the Placement Clerk." Three pages of questions are then presented, which the applicant is to answer, concerning himself. Many of these questions relate to matters of fact and biography, education, previous occupation, ancestry, health, etc. Such questions are not of immediate concern to us, although the question of their relevance or importance may fairly be investigated. But about half of the questions are of an altogether different type. In them the applicant is asked to give an estimate of his own characteristics, sometimes in vague and general terms, sometimes in terms of greater

precision. The following questions, chosen from the many included in the blank, will represent the type:

Does your mind concentrate or skip around?

Have you self-confidence?

Have you patience?

Do you act impulsively?

Are you persevering?

Do you consider yourself absolutely honest?

Can you plan well, and carry out your plans?

Are you inclined to be lazy?

Are you sensitive?

Can you remember things well and for a considerable period?

Similarly, on a college observation chart, the student is asked to grade himself at various times during his course, by assigning himself scores of A, B, C, or D in each of various traits or abilities listed on the chart. The traits, many in number, are such as imagination, humor, friendliness, self-control, poise, spirituality, etc. In such a case as this the estimation of one's own traits may have a distinct value, quite aside from the accuracy or inaccuracy of the self-estimates. The student may readily learn how imperfect is his knowledge of himself and be led to useful habits of self-observation and criticism. In the former case, however, it is asserted that the self-estimates of the applicant are to be used in determining his destiny. Here the question of their accuracy or inaccuracy is not irrelevant. Our experiments on this point can be readily presented under three headings, each indicated by a specific question.

ACCURACY OF SELF-ESTIMATES

How close to the truth does one come in attempting to grade his or her own characteristics? Twenty-five persons agreed to rate themselves in nine different traits, by indicating at what point they stood in the group of twenty-five, when these were arranged in an order of merit for each trait. Thus a self-estimate of 1 in neatness meant that the individual believed herself to be the neatest person in the group of twenty-five, with all of whom she was personally acquainted. A score of 13 would mean that in such a series this person believed herself to belong in the middle position, etc.

All the members of this experimental group constructed such a serial arrangement of the group for each trait, each placing herself at that point in the series at which she judged herself to belong. The record was made in an apparently anonymous way, but unknown to the members of the group, accurate record had been kept of their judgments, by a secret method. Each person thus not only judged herself, but was in turn judged by twenty-four of her acquaintances. If we take the consensus of opinion (combined arrangements) of the acquaintances as fairly representing the impression made by the individual on the world, this gives us a measure of her manifest character in the traits considered. We can therefore determine the accuracy of the self-estimates by comparing them with the consensus of acquaintances. The following table shows how many steps the acquaintances varied from each other, in judging an individual's traits, and also the average error made by the individuals in estimating their own position in the series.

ERRORS OF SELF-ESTIMATES COMPARED WITH ESTIMATES OF
ASSOCIATES

Trait	Average Deviations of Judgments of 24 Acquaintances	Average Displace- ments of Self-Esti- mates from Position Assigned by Acquaintances
Neatness	4.5 steps	5.8 steps
Intelligence	3.7 "	6.0 "
Humor	4.5 "	7.3 "
Conceit	4.1 "	5.7 "
Beauty	3.8 "	6.0 "
Vulgarity	3.5 "	6.1 "
Snobbishness	4.8 "	5.1 "
Refinement	5.9 "	7.2 "
Sociability	4.7 "	5.4 "
Averages.....	4.4 steps	6.1 steps

If we bear in mind that purely chance arrangements of such a series, from time to time, would give each individual the same average position in the series, and that the average deviation of all the separate positions from this average would be on the average a little over six steps, it is at once clear that these individual self-estimates are nearly as inaccurate as they possibly could be under the circumstances. The average displacements of the self-estimates from the positions assigned by acquaintances is 6.1 steps; approximately what it would have been had the names been shuffled instead of seriously and honestly arranged. And it is quite certain that the individual estimates in this investigation were rendered quite as seriously and as honestly as they would have been on a formal application blank. The inference seems to be that the employment bureau might just as well have tossed up a

coin, heads meaning "concentrate," tails meaning "skip around," for example, as to ask the applicant to estimate his or her degree of possession of the traits in question. This of course is on the assumption that the questions are asked of the applicant as a method of eliciting information, not merely to discover what the individual will do when confronted by such futile questions.

CONSTANT ERRORS IN SELF-ESTIMATION

Are self-estimates likely to err in one direction rather than another? Here we inquire not merely concerning the accuracy of self-estimates, but concerning any constant tendency or tendencies toward bias that may be present. In judging ourselves do we overestimate or underestimate? It may of course be suggested at once that our general knowledge of human nature tells us that individuals will overestimate their good points and underestimate their bad ones. But "general knowledge of human nature" is always to be mistrusted until it is verified under controlled conditions. It may, for example, be true that such a general tendency is present, but that it is more conspicuous in some traits than in others. And in some traits there may be no constant error at all. The experiment we have just described gives us material for investigating these tendencies, if we merely record whether the self-estimates place the individual higher or lower in the scale than the position assigned her by acquaintances. Representing a displacement toward the upper part of the scale and toward the lower part of it by (--) and (—), respectively, and averaging algebraically the tendencies for all the individuals, the data are as shown in the following table, along with certain other information.

SHOWING CONSTANT TENDENCIES OR BIAS IN SELF-ESTIMATION

Data Secured from Study of Estimates of 50 People

Trait	Constant Error	Over- estimating Themselves, Per Cent	Under- estimating Themselves, Per Cent
Refinement	+ 6.3	80	20
Humor	+ 5.2	78	22
Intelligence	+ 3.0	68	32
Sociability	+ 2.2	68	32
Neatness	+ 1.8	50	50
Beauty	+ 0.2	50	50
Conceit	— 1.7	48	52
Snobbishness	— 2.0	36	64
Vulgarity	— 4.2	34	66

In general our expectations from "knowledge of human nature" are realized. Traits which we should on the whole characterize as "admirable" traits are overestimated; traits ordinarily classed as "reprehensible," on the other hand, are underestimated. And this occurs in spite of the fact that the conditions of such an experiment perhaps incline a participant to resist the natural inclinations to a greater or less degree, in so far as one might through modesty place himself at a lower point than that at which he confidently believed himself to belong.

But this is not all of the story. Some traits, such as neatness, beauty, and conceit, may readily be classified as "admirable" or "reprehensible," yet these traits show no considerable constant error of self-estimation in either direction. And the constant errors for some of the admirable and for some of the reprehensible traits are fully twice as great as those for other traits in the same general group. The very least that we can say, on the basis

of the results, is that in discounting an individual's opinion of himself or herself, no "blanket allowance" can be made for all traits indiscriminately. The errors of self-prejudice are greater in some traits than in others. It is possible that the degree of constant error measures the degree of desirability or undesirability attributed by the individual to the trait in question. The order in which the traits occur in our table would on this basis indicate their order of desirability on the part of our subjects, and the size of the error would reflect the degree of desirability or undesirability. Not having included those traits, we cannot infer that "Cleanliness is next to godliness," but it may be safe to judge that humor is next to refinement, in the evaluations of our judges. The fact that sociability and snobbishness, which are in a sense opposite traits, show opposite constant errors of almost equal amount lends a certain probability to this conjecture.

Evidence confirming these suggestions has recently been reported by Knight and Franzen.³ These investigators compared estimates of the importance of traits for the judges themselves, estimates of their importance for the typical member of the group, and estimates for the ideal member of the group. There was a definite tendency "to place one's self nearer the ideal than the typical." "There is a higher association between what they believe they are and what they would like to be, than between what they believe they are and what their fellow students believe they are." In a related experiment students and professors showed "a clear tendency to speak well of themselves in those virtues considered of greater importance

³F. B. Knight and R. H. Franzen. "Pitfalls in Rating Schemes," *Journal of Educational Psychology*, 1922.

by them, and to rate themselves less highly in traits considered less vital." "We think that this tendency to over-rate one's self and the extent to which any one individual does it, has possible diagnostic value quite apart from the truth or falsity of the ratings themselves."

QUALIFICATION OF JUDGES

Does the possession of a trait accompany ability to judge that trait correctly, either in self-estimation or in the judgment of others? Is the best inspector or superintendent of teachers one who herself excels in the art of instruction? Is the best literary critic one who is himself an artist in composition? Is exceptional journalistic aptitude a prerequisite of distinguished editorial work? Put in these forms the question assumes more than a theoretical interest, and it is a question on which practical policies do not seem entirely agreed. While we cannot pretend to solve the whole problem, we can at least show what was the case in our own inquiry. For we have measured the ability of each individual to judge himself and others, and we have also measured the standing of each judge in the traits considered. What relation exists between these various measures?

The table on the following page gives the results. The figures give the correlations (coefficients of agreement) between possession of a trait, or standing in it, on the one hand, and on the other hand, ability to judge that trait correctly either in self-estimation or in judging others for their possession of it.

In general the more "admirable" the trait, the closer is the relation between possession of it and ability to judge it. The three traits we have classified as "repre-

hensible" give either very low positive correlations or, in four cases out of the six, negative coefficients. The latter cases suggest that lack of the trait in question is more likely to characterize those who are able to judge it, and this relation is especially clear in the case of judgments of the self. If then we define a trait as a desirable characteristic or aptitude, the inference is that in the long run the ability to judge the trait tends to be an accompaniment of the possession of it, and that the degree of the ability to judge varies directly with the degree of the possession of the trait.

CORRELATIONS BETWEEN POSSESSION OF TRAITS AND
JUDICIAL CAPACITY

Trait	Relation between Possession of a Trait and Accuracy of Self-Estimation in That Trait	Relation between Possession of a Trait and Ability to Judge It in Others
Humor .....	.87	.59
Refinement .....	.83	.38
Intelligence .....	.59	.49
Sociability .....	.47	.48
Neatness .....	.45	.22
Beauty .....	.15	.23
Conceit	— .22	.19
Snobbishness	— .27	.33
Vulgarity	— .37	— .24

Interesting confirmation of these general findings is reported by Allport and Allport from the Harvard Laboratory. Different people were asked to estimate their own intelligence by the rating scale method. They were later given intelligence tests, and their self-rankings compared with their score in these tests. There was a definite ten-

dency for those high in intelligence to underestimate their own ability, and for those low in this trait to overestimate themselves. The errors of the former group were also less than those of the latter, in magnitude. The correlation found between self-estimates of ability and scores in the Otis Group intelligence tests was $-.67$. Of the sixteen individuals in the group, only one of those who scored above average in the intelligence measures overestimated his own ability, and but one of those who fell into the lower half of the group, as measured by the tests, failed to overestimate himself. The average error of the less intelligent half was more than twice as great as that of the more intelligent half.

These natural tendencies in self-estimation may be summarized briefly in the following way. The individual judges himself less accurately than others judge him, and on the whole self-estimates have only chance accuracy. The individual's judgment is moreover a biased one. He tends to overestimate or to underestimate himself according to the presumed desirableness or undesirableness of the trait. But those individuals who actually possess a given desirable trait in high degree are more accurate in their self-estimates for that trait than are those who possess the trait in lower degree.

IMPROVED TECHNIQUE

What suggestions by way of improved technique does the investigation of self-estimates afford? If we now refer to a preceding page on which are given sample questions from the application blank of the employment agency, it is clear that the traits considered in these questions are not all equally admirable, or reprehensible, as the case

may be. Our results suggest that the correctness of the self-estimates of the applicant will vary with his conception of the desirability of the trait. An entirely practicable suggestion is that before the applicant testifies to the degree of his possession of the traits, he be asked to rate the traits considered, grading them according to their value or importance for the work in hand, or for the position for which he applies, or for life in general. Such a step in technique is easy of execution, and in addition to affording useful insight into the candidate's expressed conception of the value of qualities called for, it affords at least a suggestive criterion on the basis of which to check up his estimates of his own character. But perhaps the most important result of this inquiry is the definite evidence that self-estimates are misleading and that this traditional method of judging character lacks the accuracy that its prestige suggests.

CHAPTER VII

TRADITIONAL METHODS: IV, RECOMMENDATION AND TESTIMONIAL

THE JUDGMENT OF ASSOCIATES

No less important than the correct evaluation of the individual's self-analysis is the problem of evaluating the judgments which his acquaintances pass on his mental constitution and qualifications. Not only does the youth often determine his choice of a vocation by relying on the advice of his associates, teachers, and friends; his success in securing an opportunity to undertake any kind of work whatsoever often depends on the oral or written estimate of some other person of whom inquiry is made. Selection on the basis of the testimonial and the recommendation has come to be a traditional vocational step.

The problem of judgment of character is one which is continually confronting people of all classes and stations. In many instances the correct estimate of a person's character is of vital importance. The success of officers of administration from the President of the United States to the school superintendent of a small village depends often on their ability to choose for their subordinates persons of the proper character. In everyday life one's happy choice of friends, one's ability to sell goods, to persuade people to accept a new point of view or doctrine, to get on harmoniously with people in general in all the various occupations of life, depend upon one's ability to estimate the powers, capacities, and charac-

teristics of people. To those who have to make personal recommendations or to make use of those made by others, this question of judgment of character is a grave one. Is it possible for one to judge at all fairly the character of another? ¹

We are concerned here not with inference from physiognomic features and anthropometric measurements, but with impressions based on the observed conduct, expression, and achievement of the individual who is in question—his or her characteristic behavior, attitudes, activities, reactions, and accomplishments. When the individual being judged is a total stranger and the judgment is immediate, estimates of character are of course merely of the type discussed in preceding sections.

Letters of recommendation, in spite of the common addiction to them, are often sealed with a shrug and opened with a smile. These strange attitudes toward a hallowed institution have a complex origin. For one thing the motives back of the writing of such letters are not always unmixed. The letter may be only one way of "speeding the parting guest." The enthusiasm of the writer may indicate only his joy over a separation long overdue. More perfunctory comments, on the other hand, may be less closely related to the mediocrity of the candidate than to a personal apathy with regard to his destiny. Of the writing of testimonials there is no end, and the very familiarity of the task may conspire with the limitations of vocabulary to give a conventionized tone to such letters of recommendation.

With these and many other factors involved in the evalu-

¹N. Norsworthy, "The Validity of Judgments of Character," *Essays in Honor of William James*, p. 553.

ation of testimonials we are not now concerned. Instead, we shall consider the judgments of character passed by associates and acquaintances, when they are delivered under the relatively simple motivation of fairness, candor, and accuracy. These opinions of associates, previous employers, supervisors, teachers, and others are presumed to be on the basis of a fuller perception of character than are those of the interviewer, the application clerk, and the inspector of photographs. Based, as they commonly are, on longer and more direct experience of the applicant's conduct, they represent better samples of the way the candidate's character is manifested. But this is far from implying that such verdicts are wholly reliable or invariably correct. What information has the experimental method yielded that may enable us to evaluate the validity of these judgments of associates?

TESTIMONIAL DISAGREEMENT

For one thing, the first table of results given in Chapter VI shows the average deviations of the judgments of twenty-four associates in reporting the relative standing of twenty-five people in several traits. These deviations (see page 93) range from 3.5 steps and 3.7 steps in judging vulgarity and intelligence to 5.9 steps in estimating refinement. Bearing in mind that chance arrangements would have given average deviations of only a little over six steps, the disagreement on refinement is seen to be almost as great as chance would produce. The closest agreements, 3.5 and 3.7 steps, are over half as great as chance deviations would have been. Several conclusions are at once suggested.

Acquaintances disagree considerably in their estimates

of the traits of candidates. In judging some traits they disagree almost as much as possible. Their disagreement varies considerably with the trait in question. It could also be shown that their disagreement varies with the candidate who is being judged. In order for there to be disagreement, some or perhaps all of the estimates must be in error. Since disagreement implies errors and errors are what destroy validity, we can profitably examine somewhat more closely into the nature and location of these disagreements.

Data are available from several studies in which longer arrays of traits were considered. The numbers of judges (acquaintances) were smaller and the results lack the finality that we could desire. But the principle involved is clear and the independent studies give such consistent results that they must serve as the point of departure for future inquiry. In the one case (Cattell) twelve scientific men estimated the character of five of their colleagues, assigning them grades in all the traits. In the other case (Norsworthy) nine members of a college organization were similarly judged and graded by five of their intimate associates.

In both cases the judges disagreed with one another in characteristic ways. In particular, their disagreement was measurably greater in some traits than in others. If in each case we take the average disagreement on all traits as a basis (100), we can express closer agreement and greater disagreement than this standard by figures correspondingly lower and higher than 100. This enables us to compare all the traits in both the studies, and to combine the two sets of results. In the table opposite the results are thus expressed. The average deviations of the judges

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have in each trait been divided by the average of all of the traits. Decimals have been dropped from all of the measures. The traits are arranged in order from the most consistent to least consistent, on the basis of the combined results of both studies.

SHOWING THE AMOUNT OF DISAGREEMENT AMONG JUDGES IN
ESTIMATING, ON THE BASIS OF ACQUAINTANCE, THE
TRAITS OF OTHERS, IN TWO INVESTIGATIONS
Relative Divergence of the Various Judges

Trait	Cattell 12 Judges	Norsworthy 5 Judges	Average of Both	Classification
Efficiency	75	92	83	Class A Median 89 Close Agreement
Originality	95	77	86	
Perseverance	75	101	88	
Quickness	90	88	89	
Judgment	100	78	89	
Clearness	104	75	90	
Energy	75	109	91	
Will	85	98	91	Class B Median 100 Fair Agreement
Mental balance	110	81	96	
Breadth	100	92	96	
Leadership	90	103	96	
Intensity	85	113	99	
Reasonableness	115	86	100	
Independence	104	98	101	
Refinement	90	116	103	
Physical health	115	92	103	
Emotions	120	91	105	Class C Median 118 Poor Agreement
Courage	100	119	109	
Unselfishness	115	106	110	
Integrity	104	130	117	
Coöperativeness	125	113	119	
Cheerfulness	130	112	121	
Kindliness	120	125	123	

THE HIERARCHY OF CONSISTENCY

The differences between the results from the two investigations are not great, and can usually be understood by reference to the personnel and circumstances of the two occasions. Most important are the average results. They disclose a fairly definite hierarchy of consistency, for the circumstances described. At the upper end of the series the traits are judged with approximately 80 per cent of the standard disagreement; at the lower end, with over 120 per cent of this standard. The traits fall into three not entirely arbitrary groups, which we may designate A, B, and C groups. The B group represents close to average disagreement, the figures being not more than 5 per cent removed from the standard (96 to 105 inclusive). The A group contains traits on which disagreement is relatively small; the C group contains those on which disagreement is relatively great.

If an associate or acquaintance reports upon an A trait, there is reason to expect the testimony of other associates to agree fairly well with this report. A single testimonial relating to such traits has relatively high validity. But if an associate reports upon a C trait, there is abundant reason to expect other associates to deliver radically different judgments. A testimonial relating to such traits should be viewed with caution, for it represents but one of many discordant estimates. Single testimonials relating to the B traits, while not inviting active suspicion, should nevertheless provoke a certain reserve. Some associates will agree with it fairly closely, but other opinions will differ, and all will be worth considering.

In general, then, the higher the trait stands in the

hierarchy, the greater the validity of the single testimonial. The lower the trait stands in the table, the greater the justification for delaying action until all the votes are in. However incomplete this list of traits may be, it includes a fairly rounded analysis of character in the vocabulary of ordinary speech and letters of recommendation. Such a scale of validity constitutes a useful guide to the evaluation of the testimonial of character.

Moreover the analysis suggests a general principle, on the basis of which other terms or traits may be classified. The A traits we may designate as "objective," in the sense that they represent reactions to objects and impersonal situations and tasks, and are likely to result in objective products such as inventions, factories, books, bank accounts, salaries, positions, records, etc. These objective products are definite manifestations of the traits in question and they are open to general inspection. The C traits, on the other hand, represent reactions to the presence and character of other persons. They are personal, social, moral; they do not so definitely produce objective products open to general inspection. Instead, they lead mainly to personal and emotional reactions on the part of others; hence we may designate them "subjective" traits. The B traits stand midway between these extremes or partake of both characteristics. New traits or terms may be inserted in the hierarchy with considerable confidence, under the guidance of this general principle.

A rough check on the validity of this table of traits is to be found in the data reported by Miner, from a study of the estimates of certain traits of students by their instructors. The designated traits were common sense, energy, initiative, leadership, reliability, and gen-

eral ability. In order to ascertain the reliability of these estimates, Miner compared the verdicts of different judges in various ways, all of which gave much the same results. He does not call attention to the fact that some of these traits show higher reliability than do others, but his data show this to have been the case. If we take the results from his larger group of students, men in the School of Applied Science, the order of reliability, from high to low, is energy, leadership, general ability, reliability, common sense, initiative.

Of these trait-terms, two are to be found in the table we have just been considering—energy and leadership. General ability is perhaps nearest to our efficiency, reliability to integrity, initiative to independence, and common sense to reasonableness. If these interpretations of Miner's terms are fair, the table on the following page shows that his results approximate very closely what our general table would have led us to expect. The data from the smaller group of women students, however, do not agree so well with our table. The three traits that have highest reliability in Miner's study of the men students and the three traits with lowest reliability, are grouped quite as they would have been inferred from our table, although the precise order varies slightly.

Folsom has reported a statistical study of character estimation, in which college men rated one another for a series of traits. The traits selected were in only a few cases comparable to those in the table we have been considering, and the variability of judges was shown only by correlating the group judgments of two groups of fourteen judges each. In spite, however, of the different method, cheerfulness and kindness were found to be the least con-

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COMPARISON OF TWO EXPERIMENTS

Trait	Order of Reliability of Estimates	
	From Miner's Results	From Our Table
Energy (energy)	1	2
Leadership (leadership)	2	3
General ability (efficiency)	3	1
Reliability (integrity)	4	6
Common sense (reasonableness)...	5	4
Initiative (independence)	6	5

sistently judged of all the traits, and more objective characteristics such as personal appearance and handsomeness were the most consistent. Perseverance and enthusiasm (similar to our term energy) were included in the list. These fall in the section of our table designated the A group, and Folsom also found them more consistently rated than kindliness and cheerfulness, which fall in our C group.

OBJECTIVE AND SUBJECTIVE TRAITS

It is obvious that the objectivity or subjectivity of these traits, in the sense in which we have used those terms, is not solely a function of the meaning of the trait. Depending on the circumstances of acquaintance, a given trait may tend to be either more or less objectively or subjectively displayed. Thus the estimates of employees by their employers, of pupils by their teachers, of children by parents may be based on different sorts of data from those used in estimates of superiors by their subordinates, or of superiors or subordinates by each other. The precise manner in which the circumstances of ac-

quaintance determine the validity and variability of character estimates represents a field of inquiry that is almost entirely unexplored.

That the "objectivity" of the trait, as measured by the agreement of judges, varies with the circumstances of acquaintance may be shown by the following brief report of another experiment. Eight college students (juniors and seniors) rated five of their instructors for several traits contained in the Cattell-Norsworthy list. In the following tabulation, these seven traits are given and in appropriate columns the order of agreement of the judges, along with similar rankings from the data of Norsworthy and Cattell. The trait on which the judges agreed most closely is given first rank, the one on which they agreed the least is ranked last.

RANKING OF TRAITS, FOR AGREEMENT OF JUDGES

Trait	Teachers Judging Teachers (Cattell)	Students Judging Students (Norsworthy)	Students Judging Teachers
Efficiency	1	2	5
Energy	2	4	3
Leadership	3	3	7
Independence	4	1	6
Coöperativeness	5	6	4
Cheerfulness	7	5	2
Kindliness	6	7	1

When the judges are coördinate in status with those who are judged, the results are in accord with the general table. Students judge students in much the same way that teachers judge teachers, from this point of view. But when the judges and the judged are not coördinate, differ-

ent results may often be found. Thus the students agree most closely, in judging their instructors, on cheerfulness and kindness, precisely those traits on which coördinates disagree most markedly. They disagree widely in judging such traits as efficiency and leadership. Obviously the circumstances of acquaintance, rather than the nature of the trait as such, are responsible for these differences. These students knew their instructors from actual classroom experience. When the instructor was cheerful, he was cheerful to the whole class, and his kindness was not of the personal but rather of the institutional variety. By these traits the students were more or less similarly impressed. But the instructor's leadership or efficiency are not general classroom traits. Judgments on them would be considerably influenced by chance or variable individual knowledge of the instructor's extra-classroom successes. As a result of these circumstances of acquaintance, therefore, the objectivity of the trait will vary.

Closely related to this general point is the result of comparisons reported by Mann, of estimates of the traits of graduate engineering apprentices by their foremen and by experts who were their superior officers and less closely in touch with their actual work.

The order determined by the ratings by half the foremen agreed fairly well with the order determined by ratings by the other half (correlation coefficient .48); and the order of merit in the judgment of one expert agreed fairly well with the order according to the judgment of the other (correlation coefficient .53); but the foremen's order and the expert's order did not agree so well (correlation coefficient .24).²

²C. R. Mann, "A Study of Engineering Education," *Carnegie Foundation Bulletin*, No. 11, 1918.

An investigation³ of such problems in connection with the rating of teachers was undertaken a few years ago at the Bureau of Reference, Research and Statistics, in the Department of Education, New York City. In this study teachers in six different schools were rated by supervisors and associates in ten different traits. The "objectivity" of these traits was determined by finding the closeness of agreement of the various judges on each trait. This "objectivity" of the traits varied considerably from school to school. Of the eleven traits considered, punctuality occupied second position in two schools and either ninth or tenth in the other four schools. Professional interest and growth occupied tenth place in one school and second place in another. Understanding of children occupied first place in one school and tenth place in another. Four traits behaved somewhat more consistently, in that "they at least stay in either the upper or lower half of the series of eleven" in all the schools.

The investigator, Slawson, calls attention to the general importance of such a result, in the following words:

If this group disagreement is inherent in rating, then universal procedures become an impossibility. Rating will of necessity have to remain a local problem. The trait that lends itself best to objective valuation in one school of a large school system or in one department of a large industrial organization will not do so in another school or in another department. The choice of traits would then become a special group or special unit problem.

Detailed inquiry into the reasons for such discrepant results in various sets of judgments showed that the uni-

³ John Slawson, "The Reliability of Judgment of Personal Traits," Masters' Essay, Department of Psychology, Columbia University, 1920.

formity, explicitness and accessibility of criteria were the most important factors. General acquaintance was not found to be important, although "acquaintance with the activities appertaining to a particular trait" played a considerable rôle.

Such results clearly show that it is fallacious to lay down general statements of the precise relative validity attaching to judgments of acquaintances in the case of various traits. Instead, the safe procedure is that of deducing general principles, as we attempted to do in previous paragraphs, and of applying these principles to the particular situation in which recommendations are to be evaluated. If this process implies a certain expertness on the part of employment managers and executives, this is not to be lamented. Even in the case of more exact measures, such as trade tests and placement tests, it is the rule that tests found effective in the selection of workers for a given operation are not always effective in a different industry or in a similar industry under different managerial, technical, or marketing circumstances. In the use of these methods also technical expertness is required. Expertness, in the sense of mastery of the scientific methods underlying the work, is rapidly coming to be the prerequisite of all effective forms of personnel work.⁴

⁴See the section on Rating Scales in Chapter IX for suggested improvements in the technique of the testimonial.

CHAPTER VIII

TRADITIONAL METHODS: V, THE PERSONAL INTERVIEW

THE INTERVIEW IN THE PAST

We may assume that various stages in the conventional procedure of "sizing up" the applicant's character have now been completed. After the traditional manner the letter of application has been received and passed upon. The photograph has been examined and judged. The candidate's estimates of his own virtues and vices have been scrutinized. The traditional procedure has still further devices up its sleeve. It ordinarily requires the applicant to present himself for a personal interview, and very commonly instructs him to submit testimonials or letters of recommendation from others who know him.

Since standardized interview procedures have not been widely adopted, we can define the interview merely as an occasion on which, usually for a very short time, the applicant confronts some manager, executive, foreman, or employment specialist, who undertakes to pass further judgments on his character, and especially on his fitness for a particular place or type of activity. What happens in the interview we cannot specify, since these events vary with the interviewer, his purposes, and his general conception of what is significant. We may assume, however, that the applicant's appearance is inspected, his physique noted, his mannerisms, general bearing and deportment, his dress,

and the care of his person observed. He meets the examiner, and may be introduced to others in his presence. He is asked questions and given opportunity to express himself in speech and gesture. The import of the questions we cannot specify, but they are presumably relevant to his past, his plans, and his qualifications, his general habits, interests, and affiliations. In special cases he may be taken for a tour of the plant or institution, or he may be invited to luncheon, or otherwise observed in public. But the traditional interview does not involve these elaborations. It is more likely to consist of a brief inspection and conversation, lasting but a few minutes.

It is not our present purpose to attempt to prescribe what should occur in an interview, to dictate questions that should be asked nor points that should be noted, nor to recommend any special mode of report for the interviewer. Such an undertaking can be usefully attempted only after a study of the particular requirements of a given case or type of cases. We shall instead concern ourselves with a study of the characteristic results of such interviews, from the point of view of their reliability. The method will be that of noting the amount of agreement between different interviewers, when they have passed judgment on the same candidates for the same positions.

EXPERIMENTAL TESTS OF INTERVIEWERS

Fifty-seven applicants presented themselves for examination by a variety of methods. A small number were to be selected from these for appointment to positions involving personal salesmanship of a well-known service. In connection with this enterprise, which required a day and most of a night for its completion, twelve sales managers

RANKS ASSIGNED APPLICANTS BY INTERVIEWERS

Applicant	Sales Managers											
	1	2	3	4	5	6	7	8	9	10	11	12
A	33	46	6	56	26	32	12	38	23	22	22	9
B	36	50	43	17	51	47	38	20	38	55	39	9
C	53	10	6	21	16	9	20	2	57	28	1	26
D	44	25	13	48	7	8	43	11	17	12	20	9
E	54	41	33	19	28	48	8	10	56	8	19	26
F	18	13	13	8	11	15	15	31	32	18	25	9
G	33	2	13	16	28	46	19	32	55	4	16	9
H	13	40	6	24	51	49	10	52	54	29	21	53
I	2	36	6	23	11	7	23	17	6	5	6	9
J	43	11	13	11	37	40	36	46	25	15	29	1

from prominent concerns agreed to interview the applicants individually and to rate them for their suitability for the positions in question. All of these managers, or judges, as we shall now call them, were experienced in the judgment of character by this method, and a large part of their own activity consisted of such personnel selection. Each man was given a private room or compartment, allowed to interview each candidate for a definite period which was the same in all cases. Each judge was allowed to do anything he pleased with the applicant during his interview. He might talk to him, ask him questions, let him talk, put him through some exercise or test, try him out on any manner of proposition. But at the end of the interview each judge was required to assign to the applicant a designation, grade, or description which would make it possible for him in the end to classify the candidates in several groups or to rank them in order of merit, avoiding ties so far as possible. The basis of the grading was to be "suitability for the position in question."

When all the interviews were finished, the grades were assembled and so tabulated and translated that each applicant received from each judge a rating in terms of his standing in the group of fifty-seven applicants. Position 1 was considered the most suitable, position 57 the least suitable, and the intermediate positions indicated appropriate degrees of suitability. The complete tabulation is too elaborate to be given here, but we may take a purely random sample as illustrating the nature of the results. Each applicant was given a number before the interviews began, these numbers being assigned in a random order. In the table on the preceding page are given the ranks

assigned to the first ten applicants, by all of the twelve sales managers or judges.

The facts shown by the table are instructive enough. Almost any given applicant is likely to receive ratings placing him at any point in the scale, from first position to last. Applicant C, for example, is given position 1 by one judge, 57 by another, 2 by a third, and 53 by a fourth judge; in general he occupies positions all along the scale of "suitability." Much the same result is to be observed with all of the applicants. Occasionally an applicant is found whom all the judges tend to judge more or less favorably. Thus applicant I may be said to be favorably rated, on the whole, although even here the positions assigned him range all the way from 2 to 36. Some applicants again tend more or less uniformly to be rated low. Thus applicants A and B are on the whole rated low, but their ratings range from 6 to 55, and judge number twelve, who was unable to avoid ties in his ratings, assigned both men to the same position.

When it is borne in mind that these judges were not casual people who were enlisted in the investigation, but expert sales managers, experienced interviewers, and directors of personnel, and that the position (salesmanship) for which they were rating the applicants was precisely in the line of work in which they had developed expertness and acquired positions of responsibility, the inference is clear. However much the personal interview may be improved by better methods of inquiry and report, in its traditional form it is highly unreliable. No better evidence is required than the spectacle of two different expert interviewers, one rejecting an applicant as the most unsuitable of the group of fifty-seven, an-

other selecting him as the choice specimen of the lot.

SIMILAR INVESTIGATIONS

Binet once investigated the value of the interview method as employed by experienced teachers in estimating the intelligence of pupils. During an afternoon in the laboratory, three teachers interviewed independently five identical school children and reported upon their intelligence. Each judge was allowed perfect freedom in choice of method, but the judgment was to be based on the results of the interview. Binet shows that there was scarcely any agreement among the various estimates, although each teacher had considerable confidence in her own opinions. He points out the lack of uniformity and consistency in the devices employed to discover the children's intelligence, and shows how unreliable and misleading such unstandardized procedures are. The replies to loosely formulated questions about school subjects, observations on current events, skill or expression in reading, memory, facial appearance, shape of head, behavior of the eyes, and similar details were cited by teachers as sure signs of intelligence. Some teachers were found who were sure that not more than once in a thousand times would their opinions be wrong. Binet also observed that these judges, before the close of the interview, were likely to utilize a rough approach to the method of tests and he uses the experiment as an occasion for pointing out the necessity for better formulated test methods and the close relation between the more exact methods of tests and the rough methods often relied on in the personal interview.

An array of data similar in character to the results

shown in the foregoing table has been reported by Scott. Six managers in charge of the selection of salesmen in different districts, interviewed thirty-six applicants.

Each manager was instructed to assume that he alone stood between the applicant and the pay roll of the company. This was a responsibility that every manager was familiar with. Following the interview each manager made a report on each of the thirty-six applicants and indicated which was the most likely candidate, the second best, the third best, etc.

Scott gives a detailed table showing the considerable disagreements of these expert interviewers. He concludes:

As a matter of fact, in the case of 28 of the applicants, these six managers disagreed as to whether the individual should be placed in the upper half of the group or in the lower half of the group. An inspection of the table shows much agreement among the six managers, but the disagreements are striking. Thus applicant 17 was thought to be the third best of the group by Manager C; but was placed thirtieth by Manager B. Applicant 18 was thought to be the best in the group by Manager E; but was ranked as tied for the thirty-second place by Manager D. Yet there is reason to believe that these six gentlemen agreed even more closely than is the case with employment agents in general.

IMPROVEMENTS IN METHOD

In recent years much thought has been given to the improvement of the interview as a method of judging character.¹ Perhaps the most obvious suggestion afforded

¹ Thus Snedden has attempted to develop the interview into a definite intelligence test for special purpose, without the subject's knowing that he is being thus tested. This is done by employing a standardized series of words, which amounts to a vocabulary test. See Donald Snedden, *A Study in Disguised Intelligence Tests*, Teachers College Contributions, No. 291, 1927.

by our present inquiry is similar to that found in the case of the judgment of photographs. Since individual judges are prone to error, multiplication of the judges may well serve to eliminate the error and to set forth such truth as each interviewer is able to discern. The least that can be said is that the larger the number of interviewers, the more nearly does the final record approach to the impression the applicant is destined to make on the world at large, and this, we have seen, is by definition his true character. The practical adoption of the suggestion to increase the number of interviewers may of course encounter difficulties. Multiplying the number of judges involves longer time, greater cost, and more thorough record keeping. But errors in judging character also lead to delay, expense, waste, and extra effort. From the point of view of an industry or an institution the question is largely one that can be solved by simple arithmetic, a direct computation of profit and loss by the two methods. From the point of view of society at large and especially from the point of view of the applicant whose character is passed upon and whose destiny is thereby definitely affected, the issue transcends the bounds of arithmetic.

Aside from the increased validity secured by the multiplication of interviewers, it is quite certain that the individual interviewer can increase the reliability of his judgments in most cases by the proper attention to his methods. This does not mean necessarily reducing the whole interview to a rigid and formal interrogatory. Instead the informal impression, the vague general reaction, should be given its due weight, providing that the interviewer has learned that his reactions to personal appearance, attitude, bearing, manner, of others, fairly represent

the reactions of others. Private "hunches," personal antipathies arising from particular idiosyncrasies such as complexion, dress, accent, diction, should not be permitted to overweight the judgment. But the general impression, which represents the most probable first effect of the presence of the candidate on others, is usually not unimportant, and is worth recording. It should, moreover, be recorded as an independent item, and not confused with the verdict based on other data.²

Next to the importance of segregating personal impression from other items is the importance of discriminating choice of questions. The interview is so largely a matter of interrogation and reply that the question easily tends to become perfunctory, and to be merely a means of occupying the candidate while a general scrutiny permits the development of general impressions of favorableness or unfavorableness. The method of personal interview in many ways combines the use of application forms and the use of trade tests. In both these cases progress has come through sharp determination of the respective relevance of various questions and the appropriate weighting of the corresponding items in the report. In general, the interview should supplement the application blank and pave the way for definite and objective trade tests.

In the first place previous job analysis and specifications should enable the interviewer to know definitely what information he can look for that bears directly on the candidate's competence. He should proceed directly toward this information, as soon at least as a few general introductory questions establish a general feeling of rapport between interviewer and candidate. Each relevant characteristic

²See also the section on Rating Scales in Chapter IX.

should be independently scored, in as objective a fashion as rating scales will permit, and, if time allows, definite record should be made of those acts, words, or indications which serve as the basis of the judgment. This will enable others to make their own judgments and to check up the impressions of the interviewer. Questions should be so framed as actually to elicit information, and not to permit of specious correctness through random replies or through suggested answers. In these respects the work of the interview is the same as that undertaken by the social worker, the physician, the lawyer, in the development of a personal history or a section of testimony. The art consists essentially in: (*a*) establishing a favorable rapport; (*b*) discriminating between relevant and irrelevant questions and replies; (*c*) on the one hand the elimination of, and on the other hand the effective and deliberate use of, suggestive questions; (*d*) independent recording of facts elicited as distinguished from inferences drawn; (*e*) standardization or consistency in form of verdict and in terminology of report; (*f*) sagacious synthesis of varied independent items; and (*g*) typical or representative personal reaction to that total ensemble of elements that constitutes the candidate's appearance and attitude.³

³Prospective interviewers may be referred to two chapters on "How to Ask Questions" and "The Observational Method," in H. C. Link, *Employment Psychology* (The Macmillan Co., New York, 1919). These chapters are full of valuable suggestions looking toward the improvement of the method of the personal interview.

CHAPTER IX

COMMON SOURCES OF ERROR AND THEIR CORRECTION

SPECIAL TENDENCIES OF JUDGMENT

Certain common sources of error in the judgment of others, even under generally favorable circumstances, may be pointed out. The *central tendency of judgment* is an influence that has been clearly observed in judgments of all sorts, even in judgments of very simple perceptual materials. Judgments of time, weight, force, brightness, extent of movement, length, area, size of angles, have all shown the same tendency to gravitate toward a median magnitude, the result being that stimuli above that point in the objective scale are underestimated and stimuli below overestimated, while the median magnitude itself is invested with no constant error. Just as our experience with a class, race, or social group results in the conception of a *type* which shall in some way represent the central tendency of the group, and from which the separate members shall deviate the least, so also in an experiment on sensible discrimination we become adapted to the median value of the series, tend to expect it, to assimilate all other values toward it, and to greater or less degree to substitute it for them.

Such a tendency seems to be present in our judgments of human traits—we underestimate the brilliant and overestimate the stupid. Terman has shown very clearly the

marked tendency on the part of teachers and parents to overestimate the intelligence of retarded children, and to underestimate the intelligence of superior children. He has moreover pointed out some of the factors underlying these errors. To what degree the central tendency of judgment affects the estimates of other traits than intelligence we cannot know precisely until we have more accurate means of measuring these traits objectively.

Another possible source of error is suggested by the fact that estimated traits correlate quite closely with one another. Thus in an earlier report of the estimates of college students by their friends the writer found the correlations of intelligence with neatness, humor, conceit, beauty, snobbishness, and refinement to be .39, .59, .44, .34, .43, and .49 respectively. In this connection the following comment was then made. "How far these figures measure definite relations between different and specific traits, how far they measure the degree to which one's impressions of various traits conspire to make up one's notion of other characteristics, or how far they measure only the degree of confusion that exists as to the precise meanings of the various words, it is exceedingly difficult to say."

Thorndike has more recently reported similar findings as follows:

In a study made in 1915 of employees of two large industrial corporations, it appeared that the estimates of the same man in a number of different traits such as intelligence, industry, technical skill, reliability, etc., etc., were very highly correlated and evenly correlated. It consequently appeared probable that those giving the ratings were unable to analyze out these different aspects of the person's nature and achieve-

ment and rate each in independence of the others. Their ratings were apparently affected by a marked tendency to think of the person in general as rather good or rather inferior and to color the judgments of the qualities by this general feeling.

Similar tendencies were found to exist in the ratings of army officers, aviation cadets, and school teachers. "Obviously a halo of general merit is extended to influence the rating for the special ability, or vice versa."

Kohs and Irle also call attention to this tendency towards bias in the judgment of one trait by the impression of another.

It seems very probable that when one is passing a subjective judgment on the question of whether Person A possesses a certain amount of trait *a* or *b* or *c* or *d*, his judgment of practically all these is affected by some constant factor *x*. For example here is Tom Jones. Bill Smith is requested to record a personal estimate of his character, habits, self-control, intelligence, sociability—whether excellent, good, fair, very poor. What probably occurs when Bill estimates, is that each of his judgments is affected by a constant factor, possibly unconscious, such as "Tom Jones is an excellent fellow. I like him because his ideas are very attractive to me." This example is not typical, of course, but is merely utilized to illustrate the point.

College teachers who are required to grade the essays and papers of their own students are usually aware of the difficulty of separating the quality of the product from a bias for or against some special and often quite irrelevant feature of the student's personality. The managers of political campaigns soon learn that trivial and irrelevant details of physique, taste or affiliation are likely

to be as effective in determining the fate of their candidates as are actual fitness for office or the merits of platforms. Gowin found that successful executives were characterized by superior physique. It is quite probable that the relation here is not a biological but a psychological one—superior physique provokes a general confidence and trust, and suggests authority, power and responsibility. It may of course also contribute psychologically toward the self-confidence of the individual executive.

This "halo," in so far as it may be demonstrated, is not to be confused with what the writer has elsewhere called by the very awkward term "general standout-ishness." Thus mental tests of college students were found to correlate not only with estimated intelligence (.62), but also quite closely with humor (.55), snobbishness (.53), beauty (.40), neatness (.36), and refinement (.34). This may mean either "that a sense of humor, a tendency toward self-esteem, physical attractiveness, and a gentle manner dispose one's associates to think favorably of one's general mental endowment" or else that "an individual who has sufficient distinction to stand out prominently in any of these estimated traits is possessed of a nervous system which enables her to accomplish the work of these mental tests with corresponding efficiency," as well as to predispose the judges favorably toward her other estimated traits.

The possible sources of error we have considered may be briefly summarized. There is, first, the central tendency of judgment, which tends to deflect all estimates toward an average. In the second place there is the "standout-ishness" of individuals which deflects estimates of particular traits towards the general estimate of the personality

as a whole. The third tendency is for the strong impression of one trait to bias the estimates of all others. The first of these three tendencies arises from a general feature of all judgments. The last two are in part justified by the general "quality of organisms," on the basis of which many of the various traits of an individual do tend to greater or less degree to be generally high or low or mediocre. But partial justification in the long run is no excuse for overlooking the error in any particular case.

TESTIMONIAL VALIDITY

Agreement of judges is of course not in itself a guaranty of the correctness of their verdicts. In the case of recommendations and testimonials, however, which are relied on in the absence of more objective data, the validity of an estimate is to a considerable extent a function of the agreement of that estimate with others. In the case of several traits, such, for example, as musical ability, trade skill in various fields, scholastic proficiency, and intelligence, it should be possible to check up the validity of such estimates by comparing them with actual measurement. On several occasions this has been done for the trait intelligence, a trait on which judges are likely to agree relatively closely, in comparison with other traits. Thus the writer has elsewhere reported the correlation of the estimates of intelligence by associates with ability in intelligence tests. Lindsay has recently reported the correlation, with intelligence tests, of estimates of children's native ability given by teachers who had been with them in the classroom for not less than one month. The results of these various studies are summarized in the following table:

SHOWING CORRELATION WITH INTELLIGENCE
MEASUREMENTS OF:

(a) Combined estimates, by 24 friends, of the intelligence of 25 college juniors . . . . .	.70
(b) Combined estimates, by 24 friends of the intelligence of 25 college seniors. . . . .	.53
(c) Combined estimates, by 5 teachers, of the intelligence of 19 children in a tenth grade history class . . . . .	.52

Such correlations show that combined judgments do tend very definitely, but far from perfectly, to agree with the results disclosed by mental measurement. But too much should not be made of this point, since many tests have been selected as measures of intelligence by virtue of their correlation with such estimates.

Even if our examination of judgment tendencies should close at this point, the results would have an important practical bearing. But there is more to be said, especially with respect to the improvement of the traditional methods. One source of disagreement in the judgments of associates is in the indefiniteness or ambiguity of the terms used to designate the character traits. Different judges, using the same term, may have in mind not entirely the same aspects of conduct. Again, different judges, using terms which to the reader are apparently quite unrelated, may have in mind much the same concrete conduct. The ambiguity of meanings is thus one source of disagreement or equivocation in testimonials.

Another source of testimonial invalidity is the lack of uniform standards and terms of report. "Very efficient" may mean in one letter "exceptionally able." In the lan-

guage of another judge "very efficient" may mean only "satisfactory." "Clearness" may mean "rare lucidity" to one judge, and only "intelligibility" to another. Even pseudo-quantitative statements, such as "70 per cent intelligence" may mean "more than average competence" or may mean "feeble-mindedness indicating institutional care," depending on the speech habits of the judge. Thus a grade of 70 per cent in school work is a fair passing mark. But an intelligence quotient of 70 per cent is suggestive of mental deficiency to the school psychologist. Descriptive adjectives and pseudo-quantitative scores are equally subversive of testimonial validity.

THE ELIMINATION OF VARIABILITY

In the case histories of patients with nervous and mental complaints, undertaken by psychiatrists, the inadequacy of descriptive terms has often been realized. Here it is frequently necessary to delineate as clearly as possible the antecedent personality of the patient, and to record, as fully as may be, his character and conduct at the time of examination. Such case histories are often referred to by those not present at the examination, or are used for comparative purposes in determining the patient's progress, or in the comparative studies of individuals. In traditional forms these records tended easily to become lists of descriptive adjectives, expressing not the patient's conduct, but instead the examiner's interpretation or classification of his acts. Such terms as "depressed," "poor memory," "flighty attention," "excessive worry," "overactivity," "excitement," "defective judgment," "inadequate perception," and so on, obviously do little toward fixing the picture for future reference. Nor do such terms

convey to others any precise notion of the patient's behavior or condition.

In this field, therefore, it has been urged that the examiner refrain from descriptive adjectives and record instead the actual things that the patient did, quote precisely his verbal statements, give the questions asked or tests administered with the actual replies or reactions given. This substitution of narrative and description for inference and personal interpretation tends to eliminate the errors of subjective opinion and to communicate the picture undistorted by the idiosyncrasies of particular beliefs, theories, or vocabularies. Until psychiatry can use methods of measurement instead of personal reports, it is in some such way that the errors due to ambiguous terms and variable standards must be minimized.

Various methods have been suggested for the elimination of these two sources of misunderstanding. Indefiniteness of trait-terms may be remedied, for example, by presenting, instead of the single term, a group of terms conceived to be related or synonymous or approximately equivalent. But this practice may invite only etymological doubts or disputes concerning the suggested equivalence and may otherwise distract the judge. A more useful procedure in practice has been found to be the narration of instances and concrete acts, or the inclusion of a brief explanatory sentence, stating more explicitly the meaning to be given the term.

Consistency in the terms of report has been sought in several ways. A simple method is to substitute for adjectives and per cent or letter grades, a statement of the position or rank of the individual among a group of his general class, in the trait in question. Conventionally a

group of a hundred persons serves as a background for the location of the individual. Thus instead of describing an employee's "integrity" (when this is clearly defined), as "poor" or as "D," or as "60 per cent" (implying in some minds, failure), it may be said of him that he is "tenth in rank" among a hundred men of his class. This is intended to mean that only nine men in such a group of employees would have less "integrity," where as ninety would excel him in that respect.

Such a characterization does not pretend to be quantitative; it does not presume to show "how much" integrity a man has, but rather "where he stands" in this trait. Justifiable as this technique is on psychological grounds, it does not work well in practice, in part, perhaps, because it does violence to the more familiar use of numbers as signs of amounts. Perhaps the main difficulty, however, has been simply that of making practical use of any procedure before it is widely adopted and conventionalized.

RATING SCALES

Attempts have also been made to introduce concrete scales or "man-to-man" scales for each trait, each step on the scale being represented by some actual person known to the judge. Thus the judge, before characterizing the candidate in "integrity," may be requested to construct a hierarchy of real people he has known. Mr. A is to be the most nearly perfect specimen of the trait that the judge has ever met. Mr. E is to be the acquaintance in whom the trait is most conspicuously weak. Mr. C is to stand halfway between A and E; Mr. B midway between A and C; and Mr. D midway between C and E. Thereupon Mr. X is to be graded for "integrity" by locating

him on this concrete rating scale. In more elaborate forms, weighted numerical scores may be attached to these positions in various traits, according to the importance of the trait, in the attempt to provide for the summation of different traits into some total score. Of course an independent scale must be constructed for each trait that is judged. One of these forms developed by the Committee on Classification of Personnel of the United States Army is now widely known as the "Officers Rating Scale."¹

Such procedure undoubtedly has many good points. If faithfully executed it may produce more consistent ratings, both from different judges and in different cases from the same judge. But it presupposes a certain industry and a certain fidelity to the principle of the method, both of which actual judges seem inclined to avoid. Thus they tend to assign the numbers, letters, or other symbols directly, without actual production of and consultation with the various concrete scales which the method requires. What was in intent a very rough method of ranking thus degenerates into the more conventional and labor-saving use of mere descriptive terms or their symbolic equivalents.

A compromise between the demands of concrete rating and the laziness or hastiness of judges is to be found in various graphic devices. Thus a line drawn opposite a trait on the report sheet may indicate the stretch from the lowest to the highest specimen in the trait. By simply

¹A full description of the derivation and use of this rating scale is to be found in the second volume of *The Personnel System of the United States Army*, published by the Government Printing Office. A critical examination of the validity of ratings made with the aid of this and similar scales is reported by Rugg, *Journal of Educational Psychology*, November, 1921-February, 1922.

CONFIDENTIAL REPORT CONCERNING MISS A— W—

Please rate the candidate named above, for the traits indicated in large type, from the point of view of her qualifications for service either as a general houseworker or in connection with special domestic duties.

Among all the individuals so employed, within the field of your acquaintance, where would this candidate rank if all were arranged in an order of merit for each trait considered? Indicate the position in each trait by placing a dot along the line, grading the candidate as accurately as you can.

Please sign your name here.....

	Lowest Fifth	Fourth Fifth	Middle Fifth	Second Fifth	Highest Fifth
SKILL IN COOKING Knowledge of processes, variety and tastiness of products.					
SKILL IN SERVING MEALS Knowledge of customs, dexterity, promptness, and speed.					
SKILL IN LAUNDRY WORK Strength and quickness, quality and carefulness of work.					
NEATNESS AND CLEANLINESS As to personal appearance, care of premises and utensils.					

GENERAL HEALTH Robustness, freedom from incapacitating illness and physical handicaps.					
ENERGY AND EFFICIENCY Confidence in handling work, promptness and system, reliability in emergencies.					
PERSONAL INTEGRITY Honesty, truthfulness, sobriety, general level of moral conduct.					
TEMPERAMENT Cheerfulness, courtesy, cooperativeness, freedom from temper, irritability, loquacity.					
LOYALTY Fidelity to duty, care of employer's interests, interest and pride in work.					

Specific instances, characteristic acts, and similar observations will be appreciated, and may be noted on the back of this sheet.
 Mail to W—— B—— (Envelope enclosed.)

putting a mark on the line at the appropriate place the judge may indicate his estimate of the candidate's position in this series. More elaborate adaptations of this simple device may indicate the frequency with which the various degrees of the trait are likely to occur, thus roughly approaching the method of percentile ranking. The graphic rating device seems to provoke less personal resistance than do the other methods, and to require less explanation and time. If the report sheet is well organized, the graphic rating device appeals to many as an interesting indoor sport. It spares the tedious vocabulary of the conventional letter of appraisal, expedites correspondence, and pulls a higher percentage of returns. A sample report sheet based on these principles is given on pages 134-5, to be used in making inquiry of previous employers or other acquaintances, concerning a candidate for employment as a domestic worker.

A MODEL INQUIRY FORM

The advantages of such a form are obvious, once it is prepared. Only strictly relevant traits are included, these being known from a previous analysis of the traits of successful workers. Each trait is briefly but clearly defined. The number of traits included is small, and the graphic method of rating, aided by the suggested division of all such candidates into five groups according to merit, makes it a very simple matter to make a systematic record of the judge's impressions. Three groups of traits are distinguished. The first three on the form belong to the "objective" group; the last three belong to the social or "subjective" group; the middle three traits stand midway between these objective and subjective traits. The

A, B, and C traits may thus be independently evaluated, although no indication is given to the judge that his reports on some traits are considered less reliable than his reports on others. Opportunity is given to report specific incidents, acts, and observations.

SUGGESTED IMPROVEMENTS

We have, then, numerous improvements to suggest in connection with the traditional appraisal by associates. When a general and informal letter is called for, it should be suggested that the letter contain, where possible, concrete accounts of acts or attitudes, rather than merely an array of descriptive adjectives. It is, however, easier for the initiated to write such letters than it is to secure them from others, who may neither appreciate the principles involved nor find the time and convenience for adherence to them. In general, therefore, it is better to provide the reporter with a standard report sheet or testimonial form. On this form should occur a limited number of definitely relevant trait-terms, succinctly defined or illustrated. The traits should be selected with reference to their position in the local hierarchy of validity. Objective, ambiguous, and subjective traits (the A, B, and C groups of the preceding sections) may all be included, but they should be segregated for readier evaluation of the returns.

A graphic mode of record or some similar mechanical or checking scheme should be used, which eliminates the necessity of verbal ingenuity and decisions of choice on the part of the judge, who can thus devote his whole attention to the task of appraisal. Enclosed with a stamped and addressed return envelope, such an invitation to judge

one's fellow men is calculated to promote both the peace of the reporter and the validity of the report. But the validity of the ratings is subject to many qualifications, even under the best of intentions; for this reason it is desirable, wherever possible, to secure a record of the actual facts on the basis of which the judgment is passed, as well as the statement of the verdict itself. Since most of our judgments of associates are based on the summation of numerous minor impressions, it is only in special instances that the concrete data of such judgments will be available.

The peace of the reporter is only an irrelevant gain unless the validity of his report is sufficient to give it reliable accuracy. That such reliability is not attained, even under the most favorable conditions that are practicably possible, is shown by Rugg's investigation of the accuracy of various rating scale methods. After a study of many thousands of ratings, by various methods, especially in educational and military institutions, this investigator concludes that, for such purposes "the point cannot be made too emphatically that we should discard these loose methods of rating once and for all. We cannot justify wasting the time of our school administrators and deluding our teachers with fictitious 'ratings' and 'marks.' Even on one of the so-called 'standardized' point rating schemes a *single* rating has little or no scientific validity." The only circumstances in which Rugg reports such ratings to be sufficiently accurate for practical uses in education, for example, involve the following rigorous requirements. The final rating used must be the average of at least three independent ratings, made by individuals thoroughly acquainted with the candidate, on compar-

able and equivalent scales as objective in character as those of the man-to-man comparison variety, when these have been formulated in conferences under the instruction of one skilled in such technique. The impossibility of even approaching such conditions in most practical situations is of course obvious. We may, therefore, profitably consider, as our next topic, the possibility of developing more objective methods of identifying and measuring human traits.

CHAPTER X

MEASURING MENTAL COMPETENCE

THE DEVELOPMENT OF PSYCHOLOGICAL TESTS

Barren as phrenology and physiognomies were of formulable and useful results, they nevertheless served the purpose of directing attention toward the study of individual differences in mental characteristics as a distinct branch of inquiry. The next step consisted in the semi-experimental plan of observing the individual's *behavior* under a variety of uncontrolled circumstances or on more carefully planned occasions, in the endeavor to secure more or less exact quantitative expressions of the degree to which he displayed certain types of ability. Underlying the various abilities and involved in them there were assumed to lie a limited number of faculties or powers of the mind. Each individual was conceived to possess much the same faculties, but in varying degrees or amounts or forms. Attention, memory, apperception, reasoning, will, feeling, and the like, were the fundamental "faculties"; and differences in character were thought of as depending upon the varying amounts and interrelations of these fundamental faculties. In the endeavor to discover types of experiment which would measure these "faculties" it was found, in time, that a given "faculty" did not appear, on close examination, to be as unitary as it was formerly supposed to be. It was seen that to

have a good memory for one kind of material did not at once signify a good memory for every sort of thing. Determination in one direction did not imply the general quality of resoluteness. It began to be realized that attention, memory, discrimination, and the other "faculties" are very much more highly specialized than these general names indicate. The unitary soul had early been split up into the list of "faculties" or categories, and now these in turn came each to be split up into finer and finer aptitudes and tendencies, until, in the radical reaction of recent years, we find the human mind described as made up of an infinite number of independent connections or bonds between more or less specific stimulus and more or less definite response. The old "faculties" came now to be looked on as descriptive terms for certain rather general and abstracted characteristics of these multitudinous and detailed reaction tendencies, rather than as in themselves agents or powers or forces, as they were formerly conceived.

During this change in theoretical description and continuing into our present era of compromise and revision, methods were developed of measuring the amount and quality, or, more simply conceived, the speed, strength and regularity of mental and motor ability. Beginning in the form of experiments on sensory discrimination, reaction time and imagery type, and combined with physiological measurements of motor strength, rapidity and fatigue, these experiments developed, in certain hands, into what are now known as "mental tests." The principle and method of mental and physical tests is the chief characteristic of the present status of vocational psychology. Since the work of the immediate future seems destined

to develop mainly in this same direction, we may profitably consider at this point the general principle and theory of the test as an instrument of psychological analysis and diagnosis, with special reference to the requirements and implications of such tests as may be of service in vocational psychology. We shall then be in position to review the special vocational tests that have been proposed, to evaluate their outstanding results, and to point to some of the more immediate prospects and problems under consideration by those interested in the application of psychological tests in vocational analysis and guidance.

The names of Galton, Cattell, Kraepelin, Binet, Henri, and Jastrow stand out conspicuously in the early history of mental tests. The first step was the invention, description, and trial of a great number of miscellaneous tests, with little analysis of the tests themselves, the nature of the functions tested by them, or their relation to each other. Aside from the strictly motor and physical tests those devised were mainly of so-called intellectual character: measurements of speed and accuracy with which certain definite tasks could be accomplished. They were, moreover, very simple in character, not necessarily related to the work of daily life, with only a single or but a few trials made on each individual. Tests of affective and volitional factors were slower in developing. Little account was taken of interests, instinctive and emotional characteristics, attitudes, adaptation, methods of attack, limits of ability after practice, or many other aspects of individuality which later work has shown to be important.

The next step in the development of tests consisted in the coöperative effort to standardize the nature and methods, the conditions and mode of record. Many hands had

part in this process, until in recent years, through publication, comparison, and discussion of the subject, fairly uniform principles of technique, record, and treatment of measures have been agreed upon. This made possible the comparison of results secured by different investigators, and facilitated the statistical treatment of the data, so that later work might profit by what had already been tried or accomplished by earlier workers. After many years of this sort of coöperative work, another series of studies was inaugurated to attempt what has come to be known as "testing the tests." These studies proceeded by examining into the degree to which the various tests correlate with each other, with other indications of the individual's ability, with age, sex, health, education, school standing, special training, etc. Such questions as the following will suggest the problems involved in "testing the tests."

1. Which of the various tests correlate with each other?
2. What correlation exists between mental and motor abilities?
3. Do the tests measure fundamental qualities or general powers of the individual, or specialized capacities, or perhaps mainly the effect of general or special training?
4. If they measure general qualities, which of the existing tests are the best for this purpose?
5. How many trials are needed to afford a reliable index of the individual's ability?
6. What are the principal incidental factors that influence the result of tests?
7. Which tests are most easily influenced or disturbed by extraneous factors?
8. Can tests of the simpler laboratory type be used to indicate the individual's ability as shown in his daily work and play?

9. How simple or complex should the various tests be in order to give the best results?

10. How many tests, and which, are required to give a fairly correct picture of the individual's psychological make-up?

11. To what degree do preliminary trials indicate the final capacity of an individual?

12. Does the intercorrelation of tests change in any way with practice, repetition, and familiarity with the material?

13. Just what mental functions may the particular tests be said to measure?

14. How important are these functions in practical, educational and vocational life?

15. By what amounts and in what various ways do individuals differ among themselves in such abilities as the tests measure?

16. Are there other important aspects of psychological constitution and equipment for which there now exist no adequate tests?

The investigation of these numerous problems has resulted in the accumulation of a considerable literature of mental tests. Many of the earlier forms of tests were abandoned because of their unsatisfactory or meaningless character. Others have been retained and improved in form, and many new ones are constantly being devised and elaborated, described and standardized. The precautions to be observed, the instructions to be given, and the methods of record and interpretation have been presented in various books and manuals. The tests have been developed for more and more complex functions, and now relate not only to relatively simple capacities but to highly elaborate and subtle forms of achievement. As rapidly as is consistent with accuracy, norms and standards of per-

formance for different ages, school grades, vocational requirements, etc., are being accumulated and reported.

As the tests have thus developed they have been organized for a variety of special purposes, such as for school measurement, educational diagnosis, clinical examination, laboratory experiment, and more recently for the purposes of vocational guidance and selection. Among the first of these to develop systematically, and also the ones with the most immediate vocational application, are the graded intelligence scales.

Even when trait terms have been clearly defined, there is no guaranty that a list of such terms represents distinctive character elements. "Integrity," for example, may be a complex product or resultant of the organization of several features of the mental structure, just as water is a product of elements which might combine with each other or with other elements in numerous diverse ways. Character terms, such as those of daily life, represent effects produced rather than psychological functions or elements of personality. Scientific attempts to secure more accurate pictures of the mental pattern itself proceed by some method of mental measurement. Measurement begins by devising tests. A test is a standard situation which is calculated to provoke a response that can be quantitatively or qualitatively evaluated. In a sense the writing of an application and the ordeal of the interview are tests. But they occur under conditions that are not controlled and yield results not readily capable of accurate evaluation.

The test with which measurement begins is preferably a very restricted task or situation which can be readily repeated, controlled, scored, and evaluated. Measurement is facilitated if the task involves but few types of ma-

terial, few processes or functions or variables, definite and identifiable capacities, interests, feelings. Progress consists in establishing, for such identifiable details of mental make-up, significant and specific tests. Any conceivable task, performance, or bit of conduct may be made to constitute a test, if it goes through the necessary and somewhat complicated preliminary stages. Until these and various subsequent stages have been completed, the task does not constitute a measure of competence or character. To describe some of these stages in the development of tasks into tests and tests into measures, for the appraisal of human traits, is the purpose of the present chapter.

TESTS AND MEASUREMENTS

Any situation or performance may become the material of a test. Sharpening a lead pencil, defining words, threading a needle, speed of reading, adjusting a carburetor, filing a saw, accuracy of spelling, appreciation of jokes, hitting a target, preference of pictures, memorizing a poem, drawing a sketch, milking a cow, detecting logical fallacies are more or less miscellaneous and trivial examples. As enumerated, they are merely feats, reactions, feelings. They become tests when standard materials are prescribed, standardized technique adopted, standard instructions formulated and used, standard scoring methods devised. The tests become instruments of measurement when, in addition to the satisfaction of these requirements, the scores can be translated in terms of an authentic background, scale, or context of scores, and interpreted as symptoms of present status or signs of the future conduct of individuals.

For example, for the feat "filing a saw" to become a

test and then to evolve into a measure, first (materials) the size, condition and quality of saw, file and vise must be specified. Next (technique) the position of the worker, the illumination, and other details of procedure and setting must be indicated. Third (instructions) the same directions must be given to each subject and these directions should be understood. Fourth (scoring) the effectiveness or quality of the act must be stated in prescribed terms and the units that go to make up the score must be agreed upon.

Suppose all these conditions to have been observed, and an unpracticed candidate found to be able to file the standard saw, with the standard tools, by the standard method, under the standard directions, with a standard quality of execution, in thirty minutes. Thirty minutes is then the score in the test. But it is a "raw score," and in itself relatively meaningless, hence not a measure of anything except the actual duration of the act itself. But suppose that by extended use of this saw-filing test it is found that unpracticed subjects, who do this feat with this score, are those who, having a moderate native interest in tools, are sufficiently dexterous to attain the status of a journeyman carpenter and no more. The test score can now be translated into a measure, in terms of skill level attainable, of the subject's "carpentering ability." This is the essential process involved in all scientific character analysis. A test is found which serves as a symptom of more extended functions or prospects than are involved in the task itself. The inference from the detail to the larger pattern is thus more than a mere judgment, in so far as it rests on an experimental foundation of established data.

PRINCIPLES OF CONSTRUCTION

The test act itself may be planned or standardized on the basis of one of several principles. In the case just described a *standard task* was set, the completion of which is necessary before the score (time required) can be determined. Another method uses *homogeneous material* as its basis. The score is then the number of items or task units acceptably accomplished in a fixed time. Thus in the saw-filing test, the number of teeth filed in ten minutes might constitute the score. The method of *graded tasks* is also often employed. Tasks of the same nature, arranged in a series of steps of increasing difficulty, comprise such a scale. The score is then the distance along the scale which the subject's competence will carry him, either in a fixed time or without time limit. A method of *miscellaneous gradations* also presents a series scaled in difficulty, the steps, however, being represented by varied kinds of tasks or materials. Another common principle is based on *response values*. The stimuli or situations are the same for all candidates, but achievement is measured in terms of the quality of the reactions made.

Readers familiar with the names of common tests now widely used will recognize the form board and the puzzle box as cases of the method of standard task, the substitution and cancellation tests as examples of homogeneous materials, the Stenquist construction test and most vocabulary tests as instances of graded tasks. Miscellaneous gradations are illustrated by the Binet-Simon scale and its various adaptations and revisions. The principle of response values is used in the Kent-Rosanoff test for community of ideas.

PRINCIPLES OF EXPRESSION

Along with the standard modes of choosing acts, tasks, or situations, should also be considered the various standard methods of expressing the measure of achievement or response. Five chief methods are in common use. In some cases the raw scores or *original units* are used in expressing the result, as in ordinary athletic scores and in the determination of "critical scores," failure to attain which means rejection. Or these raw scores may be translated into *percentile units*, in which the standing or rank in a representative group of one hundred candidates becomes the final expression. Related to this is the use of *distribution units*, in which the raw scores are divided by some standard measure of the variability of the representative group in the feat in question. Such a measure shows the individual's position with respect to the average of the representative group. The principle of *developmental units*, such as age units, translates the raw scores into terms of the average age of immature individuals who attain this as their characteristic score. Such a measure states the "mental age" or the "maturity" of the candidate in the trait in question. The use of skill levels also resembles that of developmental units. Finally, *absolute units* may be devised, as when the accomplishment is shown to be a given number of equally perceptible steps superior to a zero accomplishment.

Original units have little place in mental measurement. Until placed in a context of other scores they have little or no meaning, and they cannot under most circumstances be combined nor directly compared with scores from other tests. Thus measures of height and weight, in terms of

inches and pounds, can neither be compared nor combined significantly. But if expressed in percentile units, distribution units, or developmental units, such comparisons and combinations are possible. By such methods, for example, it may be discovered that a given individual is "more superior" in one trait than in another. Measures of many traits in such comparable terms make possible the graphic portrayal of the "profile" or "psychograph" of the candidate in the array of tests or traits considered.

ILLUSTRATIVE TEST PROCEDURES

The following selections of tests that are easily described will serve to illustrate concretely these various methods of standardizing materials and of expressing results:

Word Building.—Consider the letters A, E, I, R, L, P. You can make words of those letters. Thus you can say E-A-R spells a word. But you cannot make R-A-T because there is no T there, nor can you make P-I-L-L for there is only one L. Make as many words as you can and write them down. Do not use any letter that is not there, and do not use the same letter more than once in the same word. (The score is the number of words you can make in five minutes, counting all words correctly spelled, excluding obsolete and foreign words, and abbreviations. About 60 words are possible.)

If we know how many words can be made by average children of various ages we can state the raw score in terms of developmental units. Thus a score of 13 words means a mental age of 15 years in this test, since the average fifteen-year-old can make 13 words in the time allowed. Or, if the candidate is a college freshman, and three minutes are allowed instead of five, a score of 13 words locates the candidate as one probable error (1P.E.)

below the average college freshman. The average freshman score is 16 words and the probable error (representing the variability of 100 freshmen about this average) is 3 words. Further, we can say that a candidate standing at this point in the distribution of ability is at the 25-percentile, or is number 25 or at rank 25 in a representative group of 100 freshmen, when they are arranged in order of competence in this test, from poorest to best. In this test, then, we have illustrated the three principal methods of expressing the measure (developmental, distribution, and percentile units).

We have still to illustrate the other methods of determining the materials. In a certain sense we can use the foregoing test to illustrate the method of homogeneous materials. If we consider that each of the words in the complete list represents an equally valuable item, as is actually the case in assigning the score, these words then represent homogeneous items which the candidate has to "think of." The number of these homogeneous tasks he can "handle" in the time set thus constitutes his score. A clear example is afforded by the following section of a familiar "substitution" test. The key at the top indicates a number as belonging to each of the various geometrical forms. The task consists in writing in each of the forms below, with pencil, the number which belongs to each, taking each form in turn across the page, and consulting the key as often as necessary. Here the various forms and the task connected with them constitute homogeneous items in the task. The raw score may be translated, as in the case of the word building test, into terms of Developmental Units, Distribution Units, or Percentile Rank.

The method of Standard Task is conveniently illustrated

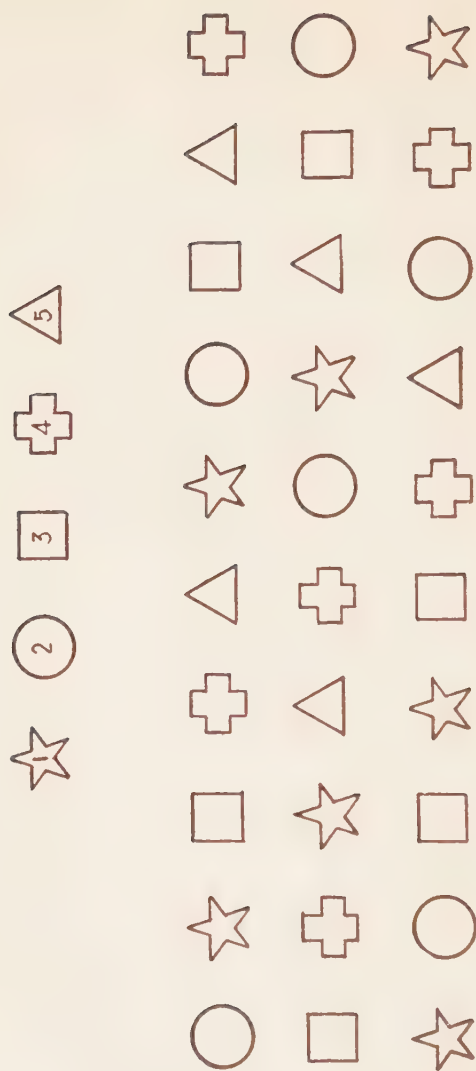


FIG. 1. SUBSTITUTION TEST

by the following assignment. There is another common English word, and only one, that can be made of the letters contained in the word CHESTY. What is that other word? Here the task is unequivocally specified. The response will be of the "all or none" type, since degrees of success are not possible, either one succeeds or fails. The score will be the time required to discover the correct reply, or else it will be simply "failure."

The method of graded tasks is neatly illustrated in a rough form by the following "rearrangement" test. Each set of letters, when properly rearranged, spells the name of a familiar animal. The tasks are similar in each case, but their relative difficulty has been determined by trial on numbers of adults, and the words have been arranged in order of difficulty. This is a "rough" illustration, because it is not known whether or not the steps from word to word represent equal steps in "difficulty."

REARRANGE THE LETTERS TO MAKE NAMES OF ANIMALS

1. snkuk	7. bnsio	13. hapletne	19. rotligala
2. niol	8. leum	14. kmyeon	20. laglroi
3. rede	9. seomu	15. duonh	21. tinram
4. tgrei	10. shroe	16. yeteoo	22. lettru
5. barze	11. goroanka	17. lqriurse	23. clreoicdo
6. selwae	12. delopra	18. kunmpchi	24. peatnole

For exact purposes it is desirable that the steps in such a graded scale be equal. But equality may be present in one or more of various senses. The advance may represent a step in felt difficulty, a step in the frequency of solution, in the average age of attainment, in the time required to accomplish it, etc. In any given case the nature of the criterion of advance must be taken into account.

The following test illustrates a more accurately graded series of tasks which are similar in general character. The steps are equal in the sense that the average time required for each item in the scale, by educated adults, is in each case except the first item approximately 25 per cent more than the time required for the item just preceding it in the scale. The average time required for each item by a group of college students, expressed in fifth-seconds, and the average deviations, are given in the following description of the test:

ANALOGIES TEST

A pair of words is given, the second of which bears a certain relation to the first. Then a third word is given in a separate column. You are to give a fourth word, which stands in the same relation to the third word, as that in which the second word stands with respect to the first word. Any word that satisfies the requirement is accepted as correct.

First Pair		Second Pair		Average Time in Fifth Seconds	Average Deviation
eagle	bird	shark		8	1.5
multiplication.	division	addition		10	2.5
opera	hear	movie		12	2.8
boat	water	train		15	3.0
gallops	horse	bites		19	7.0
color	blue	tool		24	8.3
cart	horse	automobile ...		29	17.0
eyes	face	lake		37	19.0
courage	cowardice	virtue		47	25.5
hand	fist	nation		60	32.5

The method of miscellaneous gradations is well represented by the following section of the Stanford Revision of the Binet-Simon intelligence scale. At each age level

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(developmental unit) is placed a set of tasks, which although they vary considerably in their apparent character, are alike in the sense that the ability to handle them in the prescribed fashion and with the prescribed degree of success is achieved by the typical child of that age or more, but not by the typical child of lower ages. The tasks are miscellaneous but gradation is nevertheless present.

YEAR III

1. "Show me your": nose..... eyes..... mouth.....
hair..... (3 of 4).
2. Names key..... penny..... closed knife..... watch
..... pencil..... (3 of 5).
3. Three objects in one picture: Dutch Home
Canoe Post Office
4. Gives sex.
5. Gives last name.
6. Repeats (1 of 3): (a) I have a little dog; (b) The dog
runs after the cat; (c) In summer the sun is hot.

YEAR IV

1. Compare lines (3 of 3, or 5 of 6).
2. Discriminates (7 of 10): Circle..... square.....
triangle..... other errors.....
3. Counts 4 pennies (no error).
4. Copies square (pencil, 1 of 3): *a*..... *b*..... *c*.....
5. Comprehends (2 of 3): What must you do when you are
(a) sleepy. (b) cold. (c) hungry.
6. Repeats (1 of 3): 4739..... 2854..... 7261.....

YEAR V

1. Compares weights (2 of 3): 3—15..... 15—3.....
3—15.....
2. Colors (no error): red..... yellow..... blue.....
green.....

3. Aesthetic comparison (no error): *a*..... *b*..... *c*.....
4. Definitions (use or better, 4 of 6):
 - chair
 - horse
 - fork
 - doll
 - pencil
 - table
5. Patience (2 of 3, 1 minute each): *a*..... *b*..... *c*.....
6. Three commissions: Key on chair..... brings box.....
shuts door.....

The only method not illustrated in the foregoing account is that of response values. In its more common form the value of the response is determined by its possession of some quality. The following example will serve to illustrate this method. The test is one of "free association." The words in the first column serve as "stimuli." They are read, one at a time, and the candidate is requested to respond by the first single word that "comes to his mind" upon hearing the stimulus word. Examination of 1,000 people shows that for each stimulus word some responses are "preferred;" that is, they are given by large numbers of people. Responses to a given word may be graded in their frequency, commonness, or banality, by indicating the number or per cent of people who give them. The candidate may, for each word, be given a score which is the per cent of people who give the same response that he does. The average of his scores, or some other index of their tendency, will give a measure of his "community of ideas." The quality of the response, or its value, here consists in the degree to which it represents the responses of others. In the table the words in the first

column are the stimulus words. In the other three columns are given the three most frequent responses, and the number of people who give them.

SAMPLE WORDS AND PARTIAL RESULTS FROM THE KENT-ROSANOFF
FREE ASSOCIATION TEST

Stimulus	Three Most Frequent Responses, and Their Absolute Frequency in the Test of 1,000 People		
table	chair (267)	wood (76)	furniture (75)
dark	light (427)	night (221)	black (76)
music	piano (180)	sound (95)	song (68)
sickness	health (142)	death (115)	doctor (62)
man	woman (394)	male (99)	boy (44)
deep	shallow (180)	water (134)	ocean (93)
soft	hard (365)	pillow (53)	easy (34)
eating	food (170)	drinking (166)	bread (46)
mountain	high (246)	hill (184)	valley (90)
house	home (103)	building (78)	barn (74)

The method of absolute units may be readily illustrated by one of the scales now in common use for measuring the results of education. Thus the quality of the candidate's handwriting, from the point of view of its general "excellence," may be measured. A sample of his usual handwriting is secured. As the result of preliminary investigation, a handwriting scale is ready, consisting of specimens of the penmanship of different people. These specimens are arranged as a scale, of such a sort that the first specimen has just zero value, inasmuch as it cannot possibly be read, although in its general appearance it suggests an attempt at writing. The succeeding specimens of the scale represent equal distances along the scale of "excellence," in the sense that these advances are equally perceptible or, as is more usual, agreed upon by equal

numbers of judges, that is, equally often perceptible. The candidate's handwriting may be placed alongside such a scale, at the point where its quality is judged to equal the excellence of the scale specimens. The score given it is then the number of "perception steps" by which it excels the zero specimen. Samples of such scales can be found in many of the manuals on educational measurement. They are too elaborate to reproduce in this brief survey and their valid use requires expert knowledge.

PRIMARY MEANING OF TEST RECORDS

At this point occasion may be taken to point out just what information it is that a test yields. Primarily and directly, it affords a measure only of that which it actually measures. Thus, when a specimen of handwriting is measured on the handwriting scale, there is afforded only a measure of that particular specimen of handwriting, not of the candidate's handwriting ability. If the specimen was written in excitement, haste or fear, it may indicate the tendency of his penmanship under such circumstances. If it was prepared at a given speed, the measure may suggest the candidate's general tendency when writing at that speed. If it was prepared on a moving train, its significance is again limited. The point of these comments is in general that the immediate measure is only a measure of the immediate product. Two specimens of writing may be thus compared without any special precautions, from the point of view of their excellence as present products. But unless all other conditions of performance, such as rate of writing, controlling purpose, emotional condition, degree of training, and so on, are kept constant or otherwise accounted for, the inference cannot be extended

from the actual specimen to the final ability of the candidate.

Similarly, ability to rearrange the letters to make the names of animals constitutes, directly, only a measure of that actual process. It is an error to describe the test as one of imagination, invention, intelligence, proof-reading ability, interest in verbal matters, or anything else, until, by a further process of inquiry this particular test has been empirically found not only to measure what it does directly measure, but also to indicate whatever more general facts it may be found to signify. Furthermore it is not even a direct measure of the process itself unless various other factors, such as time allowed, instructions given, motivation, and other variables are specified, kept constant or otherwise accounted for.¹

CHOICE OF TESTS

The manner in which a test is constructed and in which its results are capable of expression may often determine its suitability for a given purpose. Thus the method of standard task is less suitable for group procedure than are the methods in which a fixed time limit is established for all candidates. The method of graded tasks is likely to cover a shorter range of capacity than some of the other methods, inasmuch as a type of process or material sufficiently difficult for the higher degrees of ability may present no tasks which can be accomplished by the lower degrees. Or conversely, materials and processes suitable for the lower degrees may not readily afford tasks suffi-

¹ Cf. A. I. Gates, "Experimental Study of Reading and Reading Tests," *Journal of Educational Psychology*, September, October, November, 1921.

ciently difficult to enable the measurement of the more able. A more or less specific trait, such as ability to spell, may best be measured by the method of graded tasks, whereas for the measurement of more general and vaguely defined traits, such as mechanical skill or intelligence, miscellaneous gradations may be more readily prepared. Other illustrations might be given, but these should suffice to suggest that both the construction and adoption of tests for definite purposes call for a background of information and a comprehension of technique which the novice is not likely to possess.

The method of expressing results may also condition the uses to which a test may be put. The principle of developmental units, illustrated by the use of mental ages, has the advantage of picturesqueness and concreteness, because of the well-established age concept in other connections. But it has many limitations and it may readily lead the novice into absurdities. Thus it can only be applied in the measurement of the immature and of the inferior adult, since standards based on the principle of mental age commonly cease at points ranging from eleven to sixteen years. Moreover it is only by a kind of convention or on the basis of some analogy that the steps from age to age can be considered units. Developmental units, in other words, are not likely to be units in any other sense. To have the capacity of twelve-year-olds in one test may mean to be as good as the average adult. In another test twelve-year ability may mean marked deficiency. Therefore psychographic charts, such as those given in Chapter XV of this book, based on the principle of developmental units, can lend themselves readily to misinterpretation.

The uses of percentile units and distribution units have many advantages. In the first place they can scarcely be used without being understood, and this is a great gain. Further, they fit in with the demands of various statistical procedures, without which mental measurement cannot progress. Although such units were among the first employed in mental measurement, their adoption has been relatively slow. They do not make a strong appeal to popular fancy and their use requires a certain intelligence and technical knowledge. These methods also require somewhat more elaborate preliminary data and norms than does, for example, the method of developmental units. The ability of a stupid adult may be assigned a mental age equivalent, if norms on children only are available. But he could not be given a percentile or distribution rating unless norms on representative adults were also available.

Since nearly all children go to school and since tests can be put to good use in their instruction, it is relatively easy to secure representative norms up to about twelve years of age. Beyond that point it grows increasingly more difficult to secure representative data on the basis of which percentile or distribution ratings can be assigned to the individual chosen at random. These various points in connection with the principles of construction and expression are only samples of the many considerations required in the safe and profitable application of the methods of mental measurement. The reader who cannot think of several others is only on the threshold of a complex field of technical study. Any novice can use a yardstick, but, in spite of a fairly widespread misconception to the contrary, there are no yardsticks for the measurement of human character.

INDIVIDUAL AND GROUP METHODS

From the point of view of economy and speed the mental examination of candidates assembled in groups has many advantages. On the other hand greater accuracy and flexibility, increased reliability and fuller knowledge result from the independent examination of each individual. Many tests in common use are not suitable for group procedure since, for example, they may involve somewhat complicated technique, oral responses, elimination of error through refusal to accept inadequate or incorrect replies, scoring in terms of time, or various other complications. Limitations on the part of the candidates also detract from the reliability of test scores secured by the group method. Although success or high score in group tests may usually be taken as an indication of competence, failure or low score may result from one or more of a number of factors. Thus illiteracy, sensory defect, physical impediment, illness, misunderstood instructions, in the case of those otherwise competent, may produce inferior performance. In any given circumstance it is useful to know the degree to which group survey scores agree with results from individual examinations.

Thus in one case, in which the interest lay in the measurement of intelligence, both group survey methods and individual examination were employed on a group of about one hundred candidates. The differences in mental age as determined by the two methods were then computed, and the average difference was found to be 1.3 years. Of all the cases, 48 per cent showed a difference of less than one year. On the other hand, in 10 per cent of the cases the difference was three years or more. In

79 per cent of the cases the score by the group method was lower than that from the individual examination, and on the average the group scores were about one year inferior to those based upon individual examination. In only three instances in this experiment did individuals score lower in the individual examination by as much as two years.

On the other hand, a group of forty-seven adults who had failed to make scorable records in the group test were individually examined, and it was found that 75 per cent of these adults were below 8.5 years of mental age. For the most part, then, those who completely failed in the group examination were actually mental defectives. In general such results, which have also been confirmed by other investigators, suggest that group methods give fairly accurate measures of the average competence of the group as a whole, and fairly reliable scores for the competent or the superior individuals in the group. But low scores in group examinations cannot be taken with assurance to imply incompetence, in the absence of other evidence.

The reader will perceive that no attempt has been made to familiarize him with the many, many hundreds of tests of human aptitudes and characteristics now employed by psychologists. To master all these, to know their history, their detailed character and significance, their technique, their uses and applications, and their implications in the analysis of human character, has in recent years become a professional occupation, similar to surgery, dentistry, law, and engineering. The materials grow daily more elaborate and the field more complex. The purpose of this chapter has been, through a

general survey of the main principles, to convey a rudimentary notion of the nature of the methods of construction that have emerged in the development of this field up to the present time.

CHAPTER XI

GENERAL COMPETENCE AND SPECIAL APTITUDE

SPECIALIZED TRAITS

The foregoing chapter was mainly concerned with the description and illustration of some of the fundamental concepts and techniques underlying the development of tests and measures. The problem of *interpreting* such measures and of determining what they show about the candidate's character is in a sense an independent enterprise. The final score may be given merely as a measure of precisely that thing which was done. Usually, however, it is hoped that this act will serve as a significant index of more comprehensive aspects of the candidate's mental equipment or character.

When tests of achievement are employed they fall more or less clearly into two groups. If rating in the tests is compared with other measures or estimates, some tests are found that appear to be positively and relatively closely correlated with all or with many kinds of proficiency. Thus a test such as that of completing sentences from which certain words have been omitted has been found to correlate positively with many other tests, with estimates of associates for "general ability," or "alertness," with teachers' judgments of mental capacity, with success in school work, with age up to mental maturity, and with proficiency or status in economic, occupational, or

general affairs. Such a test appears to be a useful index of some general quality of the organism. It serves as a significant symptom of general competence. In the literature of mental measurement the term "intelligence" is commonly used to designate this general quality of the organism in so far as it is manifested in proficient action and competent conduct.

Other tests are found (such as pitch discrimination, color sensibility, strength of forearm) which do not show this general correlation with proficiency. They may be more or less unrelated to other performances, responses, or attitudes, in which case they represent or suggest special aptitudes, traits which are distinguishable from general competence. The functions indicated may be limited to the precise acts involved in the test, or they may be more extensive than this and point to aptitudes or tendencies in a certain direction or with certain kinds of material, situation, attitude, or action. Moreover, although distinguishable, identifiable, and measurable, their actual manifestation in the individual's unanalyzed life may vary with interest in them, with opportunity, and with general competence. Illustrations of such special inclinations, aptitudes, or interests may perhaps be found in such characteristics as eloquence, visual imagery, skill in literary composition, wit and humor, leadership, mechanical dexterity, esthetic sensitivity, musical ability.

In any attempt to use tests for the purposes of vocational guidance or personnel selection, it is important to know whether the measures reveal general competence or special aptitude, and whether the measures reflect native capacity solely, or are also determined by exercise; whether the contemplated occupational activity calls for special

aptitude, skills or interests, or whether it requires only such general understanding and dexterity as are involved in intelligence. Since both general competence and special aptitudes may characterize different individuals in varying degrees or amounts, it is also important to know what level of capacity, in either or both respects, the work demands, and whether the capacities required must be natively present or whether and to what degree they are susceptible of acquisition or cultivation through training and practice.

AN EXPERIMENTAL DEMONSTRATION

In the following table are brought together the results of several different investigations, in which standing in various tests has been correlated with measures of occupational proficiency or with estimates of supervisors. The figures show, for each test, the correlation in the case in question, with occupational ratings. Although the precise results and their final interpretation must be held subject to many qualifications, the data adequately illustrate a common finding in this field.

In so far as these compilations of different investigations, conducted under the same general supervision, afford comparable data, they suggest that directions, color naming and opposites, all of them familiar laboratory tests, tend to reveal general competence. They give definite positive correlations with output and with estimates of supervisors in most of the eight different types of work. Analogies and checking, equally familiar tests, are not such clear instances of general indices. Analogies, to be sure, fail to correlate with only two of the occupational activities. But checking gives zero correlation with three

types of work, and correlations below .26 in three other cases. In only one field (routing clerks) does this test correlate more closely than .40 with occupational proficiency, under the circumstances here described.

CORRELATION OF CERTAIN TESTS WITH OCCUPATIONAL RATINGS,
UNDER PARTICULAR CIRCUMSTANCES

Test	Stenog- raphy	Type- writing	Hand Sewing	Machine Sewing	Telephone Operating	Routing Clerk	Secretarial Work	Selling
Directions .....	.46	.13	.27	.12	.70	.83	.54	.14
Color naming ...	.34	.43	.43	.36	.38	.00	.38	.21
Opposites .....	.45	.14	.41	.44	.00	.98	.40	.55
Analogies .....	.31	.00	.33	.58	.00	.71	.43	.32
Checking .....	.00	.40	.26	.00	.00	.82	.22	.13

The tentative value of these particular correlations should not require further emphasis. Other studies with the same tasks, with different workers, and under different local, technical, and managerial circumstances, might very well yield different figures. And if the measures of occupational proficiency had been more accurate than they were, there is reason to believe that the correlations would have been higher in the case of some of the tests than the figures indicate. Correlations are impaired both by inaccuracy in the tests and by inaccuracy in the occupational ratings, and one of the difficult problems in establishing the meaning of tests in this field is that of securing accurate objective ratings of individuals already engaged with varying degrees of success in the occupations concerned.

But the general principle suggested in these results is a fairly universal one. Some aptitudes are more highly specialized, restricted in scope, and more nearly elemen-

tary in character; other aptitudes manifest more general functions, attitudes, interests, and qualities. The general qualities are measured by attested intelligence tests. The special aptitudes are measured by tests particularly adapted to that specific purpose. Since the equipment of special aptitudes sets limits to the repertory of intelligence or general achievement, and since general competence determines the appropriate and effective use of special aptitudes, both types of measurement are necessary in scientific analysis of character from the point of view of competence or proficiency.

TEMPERAMENTAL QUALITIES

A third group of tests may show significant relations to traits of character not suggested either by "general competence" or by "special aptitude." Instead they may disclose more or less general aspects of personality for which the terms competence and aptitude are not entirely appropriate. Traits commonly denoted by such terms as patience, honesty, coöperativeness, kindness, sympathy, stubbornness, sociability will serve as suggestive examples, although little is yet known about the conditions of these traits. In a preceding chapter we have shown that it is on these traits that associates differ most widely in their estimates. This suggests that many of these qualities or traits may be not so much traits of one individual as traits of a pair of people. A's coöperativeness undoubtedly depends on the personality of B with whom he is co-operating. Should the resulting degree of coöperativeness be attributed to A or to B? Apparently it should be applied to A and B as a team, rather than to either alone. Is a man's cheerfulness a trait of the man or a function of the circumstances in which he is placed? We expect

a stupid man to be quite generally stupid, and a musical person to be musical under all ordinary circumstances. Obviously coöperativeness and cheerfulness do not manifest themselves in this way, and such traits must be more closely related to circumstances and to social combinations of individuals than are the specific aptitudes and general competence.

It is in the judgment of this third group of characteristics that the traditional methods find their greatest difficulties. Similarly, it is in the measurement of these traits that the methods of mental measurement have made the least progress. A more detailed discussion of these difficulties will be presented in a later chapter, when a survey is given of the present status of such measurements. For the present we are chiefly concerned in drawing the distinction between three actual or possible groups of tests, those which relate to the general quality of the organism's mental activity, those which relate to special aptitudes and restricted proficiencies, and those which may be shown to be chiefly related to the temperamental characteristics, in so far as these are found to be individual traits.

ILLUSTRATIVE CASES

Illustrations of tests designed to measure general mental competence, alertness, or intelligence are easily found. Among the simpler processes that seem to serve this purpose are the various completion tests, in which verbal or pictorial materials are used. Trabue's Language Scales and Healy's Picture Completion Tests are typical instances. Tests involving the understanding of instructions, the following of directions, the perception of logical relations, the learning of codes and the association of sym-

bols, solution of problems, detection of similarities and differences, rapid and accurate classification of materials, and similar acts or processes have been found to afford good indications of general mental competence. Such tasks are included in most of the systems of intelligence measurement, such as those of the Army Alpha, the original Binet-Simon, the Stanford Revision, the National Intelligence Tests, the Otis Group Tests, the Performance Tests standardized by Pintner, the Thorndike College Entrance Tests and CAVD tests, the Association Tests of Woodworth and Wells, and the various other sets and systems assembled or devised by numerous workers in the field of mental measurement.

Definite tests for the measurement of special aptitudes, in so far as these are not closely dependent on general competence, are no less numerous. Seashore's tests of musical talent, which afford measures of sense of pitch, sense of time, sense of intensity, sense of consonance rhythm and tonal memory, seem to relate to particular aptitudes of this character. Stenquist's Assembling Tests involve a type of mechanical insight and manual dexterity which, although to a certain degree dependent on experience, do not correlate closely with achievement in intelligence tests. Various educational tests and the trade tests measure special acquisitions and skills in which general competence, however much it may be involved, is not directly revealed by the test scores. Among the educational tests are such as are designed to measure knowledge or ability in reading, arithmetic, penmanship, composition, languages, algebra, spelling, and other academic subjects. Among the trade tests are the various oral, picture, and performance tests which identify the grade of skill of a carpenter, plumber,

mechanic, chauffeur, telephone operator, boiler-maker, cobbler, etc., as being that of a novice, apprentice, journeyman, or expert. The numerous tests of sensory and motor capacities, such as those for auditory and visual acuity, color vision, tactual and kinesthetic discrimination, simple reaction time, speed of movement, strength, steadiness, and coördination, are designed to measure functions in which general competence is not closely concerned.

Among the measures of the more temperamental characteristics may be listed the various "interest" tests. In a later chapter will be given an account of some of the methods proposed for the measurement of such temperamental traits as will-pattern, emotion and mood, nervous stability, suggestibility, aggressiveness, and eccentricity of thought.

In so far as technique of construction and expression of results are concerned, all the methods described in the foregoing chapter may be utilized in all three of these groups of tests and measures. The present distinctions are not in technique but in the interpretation of results. And it is in the interpretation of results that the test method, having developed adequate measures, becomes a method of judging character.

The various scales for measuring general intelligence have been used chiefly for the purposes of educational diagnosis, in determining the degree of backwardness of children in the grades, their need for special educational attention, or the hopelessness of further pedagogical effort with them. But it is obvious at once that tests of this type are of great use to an employer in eliminating, from among the candidates for work, those who are hopelessly mentally defective, feeble-minded, and irresponsible. There

are many sorts of work in which the employment of feeble-minded persons, unrecognizable as such by their physical traits or by a casual inspection, not only entails loss and annoyance but may constitute a positive danger and constant menace to those who rely on the defective individual. Such work as that of delivery boys, messengers, domestic servants, nurses, elevator operators, drivers, motormen, etc., may be cited as instances of work into which the feeble-minded easily slip, unless there is some standardized means of recognizing them.

The importance of detecting these incompetents and keeping them from work in which their irresponsibility means economic waste and personal and social danger is of distinct vocational interest. Studies of cases brought to the Clearing House for Mental Defectives in New York City show that of the first 281 feeble-minded women of child-bearing age, about two-thirds had been engaged in some form of economic labor in which their incompetence was distinctly dangerous to those associated with them. The following table shows how these 281 feeble-minded women had been employed:

Living at home and assisting at simple tasks.....	94
Domestic service (families, bars, hotels, etc.).....	67
Engaged in factory operations.....	21
Living in institutions, reformatories, asylums....	20
Prostitutes	30
Laundresses	5
Working in stores, clerking, errands, etc.....	5
Nursemaids	9
Odd jobs	6
Married and keeping house.....	11
Housework, with relatives.....	13
<hr/>	
TOTAL.....	281

The investigators originally reporting these data write as follows:

These defective women had borne eighty-nine illegitimate children, which were acknowledged and could be somewhat definitely located, and sixteen women were illegitimately pregnant at the time of their examination at the Clearing House. Twenty-four of the two hundred and eighty-one had married and these had borne forty-six legitimate children. The average mental age of the illegitimate mothers was nine years.

The employment of feeble-minded women as domestics, factory operatives, laundresses, clerks, and nursemaids constitutes not only a nuisance to the general public, but a real source of inefficiency and danger to the community. Graded scales for the measurement of intelligence will have amply repaid the labor devoted to their formulation if they aid us in the proper segregation and vocational supervision of the mentally defective. The feeble-minded boy is more likely to be observed in the natural course of things, because of the more strictly competitive types of work into which boys customarily go, but it is far from realized how much loss of property, life, and general happiness is entailed upon the community by the indiscriminate employment of untested boys and men as floating employees.

But the vocational value of the graded intelligence scales and norms is not limited to the work of detecting and eliminating the feeble-minded. Many of the tests as now standardized yield measures of intelligence, capacity, and comprehension ranging far above the level which

constitutes the borderline of mental defect. Some of them reach somewhat higher than the average intelligence and capacity of the college freshman. It is thus possible, through the use of the graded scales, to measure in quantitative terms the general intelligence as well as various more special capacities of applicants and candidates for positions for which general intelligence is the chief requisite. Such tests are now used in many places in the selection of clerical workers, telephone operators, stenographers, waitresses, motormen, salesmen, office help, inspectors, watchmen, soldiers, and special types of factory workers. Thus one investigator tested thirty efficiency experts employed by a large industrial concern in New England. Ten psychological tests were used, including a completion test. The men were also judged on the basis of their relative abilities by the members of the firm. The combined tests correlated with the combined judgments, giving the very high coefficient of .87. The completion test alone yielded a coefficient of .64. From the point of view of vocational selection we may expect the principle of the graded intelligence scale to become increasingly valuable as more and more norms are established. This contribution of vocational psychology is thus not so much toward the guidance of the individual worker as for the guidance of the employer who may be required to select from a number of applicants those whose general intellectual equipment is most adequate. But we shall later have occasion to point out a further contribution which this makes possible, in so far as it may enable us to classify the operations involved in various types of work and to align these operations and tasks along the general intelligence scale. Such alignment will enable us to specify the ap-

proximate degree of general intelligence which a given position demands, and thus, in the case of the simpler tasks, afford a means of vocational guidance as well as vocational selection.

CHAPTER XII

DIAGNOSIS OF CHARACTER AND TEMPERAMENT

MORAL AND SOCIAL TRAITS

That people differ in what we may call temperament, as well as in competence and in aptitude, in trade skill and in educational status, is apparent. If aptitude and interest determine what they do, and if competence sets limits to their achievement, there is still to be considered their manner or mode of performance. Two workmen of equal general competence, with identical degree of special skill, will nevertheless differ in temperament and in character. One will work calmly, the other more excitedly; one will be steady, the other erratic. Confidence and distrust, cheerfulness and gloom, generosity and selfishness, courage and cowardice, loyalty and infidelity, adaptability and stubbornness, truthfulness and deceitfulness, aggressiveness and submission, taciturnity and loquacity, skepticism and credulity, and dozens of similar word pairs, indicate the extremes of various lines drawn through human character in common speech.

In mental disease the constitutional attitudes, moods, and dispositions often show themselves in heightened degree, and the volitional and emotional features may constitute essential aspects of the clinical pictures. The ancients were wont to attribute these constitutional differences to the balance of various bodily fluids in the indi-

vidual's system, the bile, phlegm, blood, or to the mixture of elements such as earth, air, fire, and water. Many modern authorities believe that some at least of these character traits depend upon the activity of various glands and their secretions. A recent writer suggests that temperament might significantly be called the "chemique" of the individual as distinguished from his "physique." Other authorities are inclined to attribute these moral or social qualities to the pattern of instinctive equipment inherited by the individual from his forebears. Some of the temperamental traits, again, seem to be explicable in terms of early established habits. Others may represent only special aspects of intelligence, or interests occasioned by special aptitudes. In a preceding section, moreover, it was suggested that many of these terms refer not so much to traits of individuals as to the conduct of particular human pairs, or characteristics of human nature under special circumstances. Link devotes considerable space to a suggestive discussion of the "relativity" of these moral and social characteristics of people. The following quotation indicates the general tenor of this author's point of view:

One of the great errors which employment managers, foremen, superintendents, and all other people, including ministers, teachers, and religious workers fall into, is the belief that the moral qualities are *absolute* qualities. They believe that if a man is lazy he *is* lazy. If he is industrious he *is* industrious. If he is cheerful he *is* cheerful. If he is disloyal he *is* disloyal. If he is ambitious he *is* ambitious. If he is good he *is* good. And if he is bad he *is* bad. In other words, they labor under the belief that the moral qualities are constant qualities which are an inseparable part of a human being as scales, fur, and hide are an inseparable feature of the fish, the dog, and

the elephant; and further, that no matter where people are and what they are doing, their moral qualities are an invariable part of their nature. Nothing could be farther from the truth. The moral qualities are not absolute. They are not blanket qualities which cover an individual's entire range of life no matter under what circumstances he may live. On the contrary, moral traits are *relative*, and their nature depends upon a very wide variety of external economic, social and bodily conditions.¹

With all these qualifications and distinctions before us, we must necessarily speak of temperamental traits with considerable reserve. Trait-terms for these aspects of personality are abundant, but knowledge concerning their elementariness, their independence, and their mutual interrelations is still to be acquired. Using these various terms, then, with a vagueness proportionate to our understanding, what progress has been made in the measurement of those characteristics to which they are intended to refer? What advance is to be reported beyond the loosely organized traditional methods described and criticized in earlier sections?

In general the history of tests of character and temperament has been similar to that of measurements of general ability and special aptitude. Clues to character were first sought in external signs and events. Then physical features, such as complexion and facial contour were examined. These failing, recourse was taken to the verdict of associates, the recommendation, and the rating scale. Then special acts were considered, which, it was hoped, might be symptomatic of more general traits—handwrit-

¹ H. C. Link, *Employment Psychology* (The Macmillan Co., New York, 1919), p. 203.

ing, control of eye movements, verbal association responses, and the like.

At present the chief activities are more specific and particular. Situations are set which are not artificial, but represent normal activities of home, school, or social life. But provision is made to observe and record the individual's behavior in these typical (and reproducible) life situations in such a way that the character of his conduct can be indicated, scored, and scaled. Whether such conduct, in the particular situation, is symptomatic of that to be generally expected thus becomes a simple experimental problem. Other situations equally natural and standardizable must also be investigated and the individual's conduct therein recorded. In this chapter we survey some of these more recent attempts to diagnose character and temperament by test procedures.

The concrete rating scales, which we have already had occasion to describe, may be said to constitute a step in this direction. They utilize personal specimens or graphic devices such as those advocated by the Committee on Classification of Personnel in the Army. These, however, do not constitute definite methods of diagnosis or measurement. They are, instead, methods of securing more systematic and consistent reports of the subjective impressions of associates. They do not contribute information not already available in testimonial reports, although they may lend definition and uniformity to this evidence. Efforts to approach more closely to the technique of test procedure may best be presented by brief summaries of representative studies, followed by a general statement of the present status of prognostic and diagnostic methods in this field.

THE SIGNIFICANCE OF HANDWRITING

Various psychologists have subjected penmanship to analysis and trial, in the endeavor to find in the characteristics of the individual's graphic performance some indication of more general trends. The theory would be that general trends might be expected to show themselves in almost any special activity, and that they might be particularly clear in such highly individual and often repeated acts as writing. If this were the case, handwriting specimens would be useful material to use, because of their definiteness, their objectivity, their permanence, and their easy accessibility.

It is clear through such studies that the detailed rules of graphologists and of chirographic systems lead nowhere. They are dogmatically stated and without verifiable foundation. Hull and Montgomery submitted ten of the typical traditional graphological criteria to test, by comparing these details of handwriting with combined judgments of associates on the traits professedly indicated. The correlations were only such as might result from chance arrangements. But such graphologists as have submitted to objective test, as in Binet's study, for example, seem to be more accurate than are their systems. Binet found that amateurs and professional graphologists alike showed more than chance success in indicating the relative intelligence of the writers of paired specimens. Even in judging their relative morality the successes were more frequent than chance would produce, and Binet was led to suggest that handwriting might yet be shown to afford valuable information in character diagnosis.

The most elaborate studies in this field are those of

Downey, who finds various significant relations between certain features of the handwriting pattern and the more general pattern of the individual's mental and motor attitudes. On the basis of her experimental findings, Downey has formulated a series of twelve tests, designated the "Will Profile" method, most of the tests in which utilize handwriting.

The series includes speeded, retarded, disguised, blocked, and automatic handwriting, slow and rapid imitation of script, and speeded writing in a restricted space. In many cases the reaction from this set of tests is somewhat definitely patterned. A relatively high score on the first four tests indicates a quick, flexible reaction; on the second four traits, it suggests an aggressive reaction; on the last four, a deliberate, methodical, careful reaction.

Through comparing test results, in an experimental manner, with known or estimated personal types, this author is led to believe that the "Will Profile" "has considerable characterological significance and that it can be used to advantage not only in getting the general temperamental pattern of an individual but also in determining the specific combination of traits." In conjunction with intelligence tests "it certainly affords, in many situations, a basis for conservative prophecy." This "Will Profile" method, based mainly on handwriting and its characteristic patterns, is now being tried out by other psychologists, and until it has stood the test of trial, criticism, and modification, its value in character diagnosis cannot finally be judged.

TESTS OF AGGRESSIVENESS

Another investigator, on the trail of character traits, is Moore, who has tried out a variety of devices. One set

of tests advocated by him is for the measurement of "aggressiveness." The series includes tests of eye control in personal interview; distraction, while adding, by staring, by electric shock, by a snake; and association responses to certain critical stimulus words. Use of the method with college students leads him to "believe that this test approximates a true measurement of aggressiveness more nearly than does the Army Alpha examination approximate the measurement of intelligence."

The unaggressive subjects, while adding a standard series of numbers mentally, were three times as likely as the aggressive one to be considerably distracted by staring or by the presence of a snake, and more liable to distraction by electric shock. The very aggressive men were four times as likely to be positive and definite in their responses to "enterprise" and "success," twice as likely to give an energetic type of response to "company"; and only one-fourth as likely to respond definitely and vividly to "danger" and "death," as the very unaggressive men.

The most important test, that of eye control, counts for one-half of the total possible score. In this test the candidate is "required to perform a somewhat difficult series of mental additions while constantly returning the fixed gaze" of the examiner. He is instructed that "under no circumstances should he let his gaze wander from that of the man facing him." While the subject works at addition, count is made of the number of times his gaze wanders and his eyes leave those of the examiner. College men, chosen by associates and faculty for estimated aggressiveness, show ten times as much eye control as do those similarly chosen for lack of this trait. The median

score of the aggressive group is "no movements"; that of the unaggressive group is "five movements." The thirteen aggressive men made a total of only six movements; the thirteen unaggressive made a total of seventy-two movements.

Thus the simple behavioristic fact of the ability to look another person in the eye seems to have such a high significance regarding the presence or absence of aggressiveness as to warrant giving it an extremely prominent place in any scoring method devised as a measure of this trait. The correspondence is in fact so close as to justify the generalization that a stop watch and a pair of fixed eyes are the only indispensable laboratory equipment necessary for estimating roughly the degree of aggressiveness in at least four-fifths of the subjects.

Queries and objections will surely occur to the reader's mind in considering the use of such a set of tests, and these difficulties will emphasize the extraordinary obstacles encountered by any attempt to find valid measures of temperamental character traits. Thus the tendency to stare at a companion or at a speaker may be one of the partial facts that leads one's fellows to classify him as aggressive. Part of the correlation with the staring test would then be spurious. On the other hand, we have insisted that character is what it manifests itself to be, and if the shifty eye really marks a man as a weakling in the eyes of his fellows it is well to single this factor out of the total impression and to take diagnostic advantage of it. A man's reputation is not nearly so remote from his character as the copy books would have us believe.

THE ASSOCIATION METHODS

A type of association test, similar to that given as an example of the method of Response Values, in Chapter X, has been used by several investigators, in the hope that it might significantly reveal the characteristic intellectual and emotional attitudes of the persons tested. In place of scoring the responses according to the frequency with which they are given by others, notice is taken of the nature of the relation between stimulus word and reaction word. On the basis of these relations several "types" of reactors have been described. Thus Jung insists that the characteristic association responses of different people in such a test do not really distinguish *intellectual* types, but rather *emotional* state.

Educated test persons usually show superficial and linguistically deep rooted associations, whereas the uneducated form more valuable associations and often of ingenious significance. This behavior would be paradoxical from an intellectual viewpoint. The meaningful associations of the uneducated are not really the product of intellectual thinking, but are simply the results of a special emotional state. The whole thing is more important to the uneducated, his emotion is greater and for that reason he pays more attention to the experiment than the educated person, and that is why his associations are more significant.

Jung then points out several types or sub-types. There is said to be an *objective* type, with undisturbed and usual reactions, and a *complex* type with many disturbances occasioned by special emotional complexes or sore points. There is a *definition* type described which "consists in the fact that the reaction always gives an explana-

tion or a definition of the content of the stimulus word." Persons belonging to this type are said to wish to be more than they are, and such reaction tendencies are said to characterize stupid persons but also persons who are not stupid but have an "intelligence complex" and are fearful of being thought stupid. In another suggested type, the *predicate* type, it is not the intellectual but the emotional significance of the stimulus word that is prominent in the response, and reaction words indicating strong personal evaluation occur. "Just as the definition type really conceals a lack of intelligence, so the excessive emotional expression conceals or overcompensates an emotional deficiency," says Jung.

The "predicate" type of response in such free association tests has also been called the "egocentric" type. "The number of these 'egocentric' associations," says Wells,² "has been thought, with reason, to bear a peculiar relation to the subject's general personality." "In normal persons, from 15 to 45 per cent of associative responses belong to this group. Single series have been taken with as low as 2 per cent and as high as 60 per cent; but the number of these is a fairly constant attribute of the individual." Excessive egocentric responses are believed to indicate either a specific or a general maladjustment in the individual's affective or instinctive life, and therefore to signify a lack of temperamental balance. Wells has reported interesting experiments designed to test out this belief, and concludes that his general results "are consistent with the view that the egocentric association type indicates a greater 'loading' of the experiment with

² F. L. Wells, *Mental Adjustments* (D. Appleton & Co., New York, 1917), pp. 261ff.

affect; and, as the affect is there to be loaded, it is evidently not taken care of elsewhere in the personality."

In similar ways the association test has been used by many investigators as giving a possible clue to temperamental traits—cheerfulness or gloominess as indicated by the predominance of pleasant or unpleasant associations; objective attitude or introversion as indicated by the relative numbers of common and individual reactions; the relative strength of instincts and interests, as indicated by the speed of reaction to certain words, the vividness of certain responses, and similar criteria. However suggestive these results may be in striking cases of mental disorder, and however truly they may reveal the special mental set or attitude taken by the subject on the occasion of the experiment, the advocates of the verbal association technique are still far from providing measures of temperament. But many psychologists still look for definite advance in the application of this method. In recent work for example, by specialists in the use of the method in various forms, it is held to be "in the foremost rank among the methods of individual psychology," and, in one of its forms to give "perhaps the best objective correlate of temperament at present to hand." But this, after all, in the light of our consideration of the validity of other methods of temperamental diagnosis, cannot be considered immoderate praise.

EMOTIONAL INVENTORIES

An interesting method was devised by Woodworth in the effort to secure an index of the individual's "emotional stability," balance, or freedom from tendencies that predispose to nervous breakdown. An inventory of

complaints or difficulties is provided, in the form of questions to be answered by "yes" or "no." Each question relates to some tendency, habit, condition, experience, trait, or antecedent which, if answered in a particular manner, specified in the scoring card, indicates the individual to be "peculiar" in that respect. To be peculiar in this sense is to have the trait or complaint which most people lack, or to lack that which most of them possess or acknowledge. The immediate interest of the inventory is not in the particular items reported, necessarily, but perhaps most of all in their number. The average or normal individual has of course a certain number of "peculiarities." College students and white army recruits, for example, were found to have an average of about ten such peculiarities, the largest possible score being over one hundred. Negro recruits were found to have larger scores than white recruits, twice as many in fact. Soldiers with nervous disorders were found to give still higher scores, the averages differing for various types of mental and nervous complaint. In one condition the average score of men in a certain hospital before the armistice was as high as forty points, and individuals with as many as seventy-five points were sometimes found.

The questionnaire method of indexing the degree of wholesomeness, the lack of "peculiarity" in nervous and mental health, we may call the Psychoneurotic Inventory.³ It is being improved, adapted, and more fully tried out, in the hope that there may develop from it a useful means of expressing a very important temperamental characteristic.

³ H. L. Hollingworth, *Mental Growth and Decline* (D. Appleton & Co., New York, 1927), pp. 262ff., gives such an inventory with key and typical results.

Thus Matthews has adapted the inventory for use with young children and adolescents. Laird has modified it for use with college students and others as a "mental hygiene inventory." House has elaborated it in various ways as a technique of exploration for psychopathic tendencies and emotional conflicts. Fleming has submitted data from the use of the inventory by detailed analysis in the search for more exact prognostic indications. References to several of these typical reports are given in the bibliography.

Perhaps the greatest difficulty in the use of such an inventory, by others than the individual concerned, is the degree to which the replies vary with the motivation of the occasion. Scores made by neurotic soldiers after the armistice were strikingly lower than were those from similar patients before this event. The change in motivation from a bias toward invalidism to a disposition toward recovery and discharge produced a more optimistic rendering not only of present status but even of facts of personal history. The method is essentially that of self-estimation, and the liability of self-estimates we have already had occasion to consider.

HONESTY AND DECEIT

Various tests for deceiving, lying, overestimating, and stealing have been proposed. The most elaborate set are those reported by May and Hartshorne,⁴ based in some instances on earlier suggestions by other authors, in other instances originally designed. School children in large numbers were studied by placing them, at school or at home, in natural but controlled situations which gave

⁴M. A. May and H. Hartshorne, *Studies in Deceit* (The Macmillan Company, New York, 1928).

opportunity for and in some cases rather strongly invited some form of cheating or dishonesty. There was "a large battery of deception tests, of which twenty-two use ordinary class-room situations, four use an athletic contest, two are in parties, and one is work done at home. There are also two lying tests and two stealing tests."

The test situations were chosen so as to conform to various criteria. Briefly indicated, these criteria were as follows: The tests should be in natural but controlled situations; should allow all subjects equal opportunity to exhibit the behavior in question; should not subject the child to moral strain beyond that incurred in natural life situations; should not put the examiner in the false social rôle of being a deliberate deceiver; should not arouse the suspicions of the subject; should have, for the subject, some genuine value aside from the test results; should not be easily spoiled by publicity; should be short, easily administered; mechanically scorable, and in general suitable for group use; should yield unambiguous results, and in quantitative form.

Typical examples of such situations may be cited. The child, having taken a test in arithmetic, is allowed on a later occasion to score his own paper from an answer sheet with which he is provided. Meantime the papers, collected for subsequent distribution and scoring, have been carefully copied, so that any change now made in the originals can be discovered by comparison with the duplicate. Such technique enables the examiner to know whether the child falsifies his initial record by copying or correcting from the answer sheet, and the amount of such falsification can be ascertained.

Maze tracing tests were used, which were very im-

probable of achievement without the use of the eyes in looking. The subjects were required to try these with closed eyes. Or in various educational achievement tests two trials were given.

On one occasion there is strict supervision and no opportunity to deceive is given. On the other occasion the conditions are such as to permit deception: the barriers are let down and the only resistance to the tendency to cheat is in the individual's own habits and attitudes. The difference between the scores made on the two occasions is roughly a measure of the tendency to deceive. Cheating consists in either copying answers from the key or in changing answers to match the key.

In another test a series of weighted and numbered pill boxes was provided, differing so slightly that adjacent members of the series could not be distinguished by lifting.

The instructions were to turn the numbers down and arrange the boxes in the order of their weight. After the first trial the pupils were told to look at the numbers on the bottom and copy these numbers off on the score sheet to show how they had been arranged. They were then told that the correct arrangement was the serial order 1, 2, 3, 4, 5, 6, 7, and were asked to turn the numbers down again and not look at them during the second trial. . . . Cheating consists in peeping at the numbers. . . . The two position scores were combined and "weighted" according to the likelihood of dishonesty.

In their present form these tests, though carefully planned and validated, and ingeniously conceived, are not proposed for use in individual diagnosis, but only in research projects with groups. Deceit, as it occurred

in these situations, was found to be definitely associated with such factors as "dullness, retardation, school grade, emotional instability, socio-economic handicaps, cultural limitations, certain national, racial and religious groupings, suggestibility of a certain type, frequency of attendance at motion pictures, and poor deportment at school."

Members of the same class room, family, and gang were found to resemble one another in their deceit scores. Various plans presumed to foster the spirit of honesty were not found to influence the behavior scores in the desired direction. The authors conclude from their data that no such entity as the "trait" of honesty or dishonesty exists, but that there is instead "a congéries of specialized acts which are closely tied up with particular features of the situation in which deception is a possibility, . . . not greatly dependent on any general ideal or trait of honesty." The actual scores were closely related to the scores in the Otis suggestibility test, referred to in the following paragraphs.

MEASUREMENTS OF SUGGESTIBILITY

That people differ in the readiness with which their conclusions are influenced by the opinions or suggestions of others, is a matter of common observation. For this characteristic the term "suggestibility" is often employed. Stern has defined this tendency as "the imitative assumption of a mental attitude under the illusion of assuming it spontaneously." What is meant by suggestibility, in this sense then, is not willingness to be convinced by adequate evidence, openness to argument and reason, but what Whipple has called "uncritical acceptance of a no-

tion, usually with the implication that the suggested individual is unaware that his ideas have been thus affected." Many tests involving suggestibility of this kind have been devised, in which through some verbal, gestural, or circumstantial suggestion, the individual is led to react otherwise than he would if left to himself.

Several investigations have employed such tests, in the endeavor to determine whether or not degree of suggestibility is a general characteristic; whether, that is, it is present in something like equal degree in all of an individual's conduct. The outcome of these investigations is with great uniformity of a negative sort. Individuals differ in any given suggestibility test, but their differences are not carried over to other tests as fixed personal differences. In other tests they differ again, but in new ways and to quite new degrees. The tendencies underlying suggestibility seem then to be specific to the situation in hand; they characterize the individual under special circumstances rather than the individual as a person. Diligent search and experiment have not succeeded therefore in discovering any tests that can be said to measure the general suggestibility of individuals, for such a trait does not seem to exist. The most interesting organized "suggestibility test," standardized on children on an age basis, is that of Otis.⁵

⁵ Interesting descriptions of typical tests involving suggestion are to be found in Whipple's *Manual of Mental and Physical Tests* (Warwick and York, Baltimore, 1915); in W. Brown, *Individual and Sex Differences in Suggestibility* (University of California, Berkeley), and especially in Margaret Otis, "A Study of Suggestibility in Children," *Archives of Psychology*, Columbia University, No. 70, 1924.

DETECTING MOODS AND EMOTIONS

Washburn and her students, in seeking for indications of moods or temperaments of cheerfulness and depression, employed the following instructions in a modified association test: "When I pronounce a word to you, observe what idea that word first calls to your mind and report whether it is a pleasant or an unpleasant idea. If it seems neither pleasant nor unpleasant, but indifferent, continue thinking until either a pleasant or unpleasant idea is suggested, and report what it is." Having determined, under the conditions of the experiment, the average tendency to report pleasant ideas for the series of stimulus words, deviations from this average were used to indicate tendencies toward cheerfulness or depression. Comparison of such results with estimates by intimate associates gave definite positive correlations. This promising lead is reported as now undergoing the further investigation which it requires before its general diagnostic value is known.

A series of five tests intended to indicate tendencies toward emotional reactions and idiosyncrasies in this respect has been employed by Pressey. The subject is required first to cross out the words in lists provided, which name unpleasant things, and to indicate in each line which word is most unpleasant. The number of unpleasant words and the number of most unpleasant words not so marked by most people, are taken to indicate tendency to emotionalize and to be emotionally peculiar. Crossing out irrelevant words inserted in dull and exciting passages of reading matter, is used to give a measure of the tendency to absorption in the more exciting passage.

In lists of acts of varying degrees of social sanction, the "worst" acts and the "most common" acts are to be indicated. Deviation from the common responses is used as a measure of moral discrimination and experience. A modified form of the free association test gives a measure of the tendency to select common associates. A test for memory of emotional and unemotional words used in the preceding tests gives, finally, a measure of "emotional memory." This test is still in very tentative form, and its value therefore undetermined.

GENERAL CONCLUSIONS

A variety of other devices might be cited as having been, in one form or another, used in the attempt to measure or analyze or identify temperamental traits. Self-analysis charts, sometimes with roughly quantitative scores suggested; graphic schemes for the visual portrayal of relative prominence of different traits as thus estimated; questionnaires, directing attention and comment to what are supposed to be significant indications of interests and attitudes; lists of interests and activities, for checking or for serial arrangement; analysis of dreams, with the intent to discover the trends and motivations of the individual's thought; estimates, by acquaintances, of the individual's possession of specified characteristics; rating scales for more systematic expression of such personal estimates; dogmatic inference from physical structure or contour to temperamental quality; and finally, the various traditional methods which we have considered in preceding chapters—these indicate the variety of techniques often utilized for temperamental diagnosis. The instances we have surveyed constitute some of the more definitely

formulated and experimentally conceived endeavors and serve to illustrate the general problem.

On the whole, then, it is clear from the survey given that the measurement of temperamental traits is still in a preliminary experimental stage. Many aspects of human character need no longer be merely judged, no longer merely guessed at by traditional techniques. General competence or intelligence, mental maturity, several special aptitudes, numerous trade skills, educational status and accomplishment, various types of vocational fitness, range of information in various fields can be objectively measured either in all or in some of their features. Until the diagnosis of temperament has passed through its earlier experimental stages, the moral and social qualities, the interests, emotional dispositions, the attitudes, and the volitional and instinctive characteristics must continue to be estimated in traditional ways. But, as we have seen, even the best of these methods admits of improved technique and more systematic application. The contribution of science toward the art of judging human character cannot be limited to the devising of tests and measures. Until that distant day when objective methods of diagnosis may be available for all the interesting features of the complex human personality, science is under the obligation of submitting even the roughest traditional methods to constructive criticism. Even when cripples cannot be cured, it is the task of science to improve the crutch.

CHAPTER XIII

INTERESTS AS VOCATIONAL DETERMINANTS

THE NATURE OF INTEREST

The psychology of interest is obscure, for the word, as a practical term, cuts across many psychological categories, such as emotion, attention, effort, meaning, understanding. Interests are also closely and doubly linked with information. On the one hand one can scarcely be interested in that of which he has no knowledge; and as a rule the more one learns about things the more interesting they become. On the other hand, one learns most about the things in which his interest is greatest, and without interest, intrinsic or derived, learning can scarcely be accomplished.

Much the same thing may be said of interest and ability. We do best the things that most appeal to us, or at least we try them with the best endeavor; indifferent tasks are neglected. On the other hand it is likely that most people are interested in doing things at which they are proficient, in the doing of which they experience a gratifying sense of accomplishment and power.

There are exceptions and qualifications to all these statements, and this adds to the obscurity of the topic. For one thing, interests change. Intrinsic interests change because the individual changes; new growth and added knowledge bring new sources of pleasure. They change

also because conditions change; new people, new inventions, new enterprises bring fresh interests. Derived interests, as well as intrinsic ones, change. The child's interest in candy is immediate and intrinsic; he is a direct consumer. But the shopkeeper's interest in candy is ulterior and derived; he is a middleman and the appeal of the commodity depends on its market and profits.

Interest is an obscure topic, furthermore, because of the difficulty of identifying and measuring or comparing interests. Suppose that a youth demanding vocational guidance already has a working knowledge of the activities of a sanitary engineer, a Baptist clergyman, an oxy-acetylene welder, and a lapidary. Believing that guidance should follow interest, how are we to diagnose his interests in these callings and know their relative strength or coerciveness?

INTEREST TESTS AND ANALYSES

Several procedures have been followed, none of them entirely satisfactory. We may classify the methods as direct and indirect. The direct method replies, "Ask him" to our query. But it asks systematically. It presents the subject with lists of objects, activities, topics, occupations, people, recreations. He is to mark these as interesting or not interesting; or perhaps he is to arrange them in order according to their interest; or to estimate, by some grading or rating scheme, their relative appeal to him. These methods assume that the individual has had ample opportunity to acquire his interests, that he knows them, requiring only to have them clearly formulated or explicitly expressed, and that they are fairly well settled.

A typical one of these interest analysis blanks, used

and adapted in various ways by several recent investigators, is described by Cowdery¹ in the following words:

Three pages of items toward each of which the subject indicates his attitude as one of liking, indifference or dislike. The items include 84 occupations, 78 types of people, 34 sports and amusements, 6 kinds of pets, 13 representative kinds of reading, 23 miscellaneous activities, and 25 school subjects. Suitable instructions are given at various points in the blank. It is practically self-administering except to subjects below the high school age (where the usefulness of the blank is yet to be determined). There is no time limit, but subjects are urged to work rapidly in order that their responses may be rationalized to the least extent possible. Adults require about 20 to 30 minutes to fill out the blank.

The indirect methods attribute somewhat greater importance to the knowledge of the examiner. They assume that what the subject does or has done can be shown to be symptomatic of his interests, even when these are not consciously known to him. His acts only require interpretation by the examiner. Thus the individual is tested for information on an array of items, the assumption being that information follows and betrays interest. Or he is asked to inventory his past activities—as his games, his reading, his social participations, his pets, his toys—the assumption being that his acts and choices have unwittingly grown out of his interests, which were largely intrinsic. He is given learning tests—as pairs of words to be associated—on the theory that interests favor readier learning. He is asked to cancel material from printed pages on various topics, on the theory that the more inter-

¹K. M. Cowdery, "Measurement and Professional Attitudes: Differences between Doctors, Lawyers, and Engineers," *Journal of Personnel Research*, 1926, Vol. V, p. 133.

esting topics will distract his attention from the monotonous task of cancellation.

Many "interest analysis" blanks, tests, and inventories have been devised by these and similar methods, and put to experimental use. Since the results are still tentative, none of them is here advocated except for further experiment. The bibliography cites references to many of the sources. We turn instead to a survey of some of the results of these preliminary explorations. The chief questions raised have had to do with the variety and range of interests, as identified by these methods, with their permanence, and with their correlation with various vocational criteria.

THE PERMANENCE OF INTERESTS

One of the earliest studies² of this point inquired whether the school subjects in which one is most interested are any indication of the interests and values of later life, how permanent these interests are, and what relation exists between interest and ability in this field. The investigation studied the interests and abilities, as subjectively expressed, in mathematics, history, literature, science, music, drawing, and manual work. The original records are the judgments of one hundred individuals concerning the order of their own interests and abilities in these subjects at each of three periods in their school career—elementary school, high school, and college. These various judgments having been made, largely from memory, and as conscientiously as possible, correlations were

²E. L. Thorndike, "The Permanence of Interests and Their Relation to Abilities," *Popular Science Monthly*, November, 1912, p. 81; also "Early Interests, Their Permanence and Relations to Abilities," *School and Society*, 1927, Vol. V.

determined between interests at different times, and between interests and abilities.

Individual relative interests at different times, according to these records, do not vary according to mere caprice. "A correlation of .60 or .70 seems to be approximately the true degree of resemblance between the relative degree of an interest in a child of from ten to fourteen and the same person at twenty-one."

College seniors (women) were asked to mark a list of vocations by indicating five choices in order of preference. The request was repeated two years after they had left college, and in many instances had opportunity for experience and actual employment to modify their likes and dislikes. Seventy-five per cent still indicated the same vocation as their first choice. But 41 per cent gave a new second choice. Fryer, in a study of high school seniors, found that about half of them had already had at least one change of vocational intention. Kitson, in a study of the relatively stable occupational group listed in *Who's Who*, found that 16 per cent had at one time or another changed their occupations.

Proctor and Ward³ report a follow up study of 771 young people who four years before, while in high school, had indicated their vocational ambitions and educational plans, and had been given intelligence tests. Vocations were classified as follows:

Rank I—Higher professional and executive work

Rank II—Semi-professional, managerial and higher commercial work

³ W. M. Proctor and Helen Ward, "Relation of General Intelligence to Persistence of Educational and Vocational Plans of High School Pupils," *Journal of Educational Research*, April, 1923.

Rank III—General clerical and commercial work and skilled labor

Rank IV—Semiskilled labor

Rank V—Unskilled labor

Of the total group, 272 were found engaged in occupations. These were less intelligent than those who had gone on to further education. Of them, 60 per cent were then in occupations ranking lower than those in which they had originally expressed interest. The more intelligent were more likely to be found to have persisted in their vocational plans. Of those in institutions of higher education, 89 per cent had ambitions ranking I and II, while only 55 per cent of those in occupations had ambitions of those ranks. Moreover, 81 per cent of those continuing their education beyond high school were carrying out plans the same as, equal to or better than their original educational ambitions. Of the 272 who had gone into occupations, only 71 had received in high school any training for such work as they were actually doing.

INTEREST AND ABILITY

In his early study of interests and their permanence Thorndike found that the resemblance between ability in the elementary school and ability in college (both subjectively estimated) was expressed by the correlation coefficient of .65. The correlation between interest in the last three years of elementary school and capacity in the college period was computed to be about .60. This would mean that the early array of interests would serve as a useful indicator of the order of the capacities of the adult. Concerning these results Thorndike wrote as follows:

The correlation between an individual's order of subjects for interest and his order for ability is one of the closest of any that are known (about .90). . . . A person's relative interests are an extraordinarily accurate symptom of his relative capacities. . . . Interests are shown to be (not only permanent but also) symptomatic, to a very great extent, of present and future capacity or ability. Either because one likes what he can do well, or because one gives zeal and effort to what he likes, or because interest and ability are both symptoms of some fundamental feature of the individual's original nature, or because of the combined action of all three of these factors, interest and ability are bound very close together.

The bond is so close that either may be used as a symptom of the other almost as well as for itself. The importance of these facts for the whole field of practice with respect to early diagnosis, vocational guidance, the work of social secretaries, deans, advisers, and others who direct students' choices of schools, studies and careers is obvious. They should be taken account of in such practice until they are verified or modified by data obtained by a better method; and such data should soon be collected. The better method is, of course, to get the measurements of relative interest and of relative ability, not from memory, but at the time, and not from individual's reports, but by objective tests.

In another study of college students,⁴ expressed interest in college subjects was correlated both with subjectively estimated ability therein, as judged by the students themselves, and with actual grades received in college. Subjective interest and subjective ability gave a correlation of $+ .57$. But interest and actual grades gave only a coefficient of $+ .25$, a very low correspondence.

⁴ J. W. Brides and V. M. Dollinger, "The Correlation between Interests and Abilities in College Courses," *Psychological Review*, Vol. XXVII, 1920, pp. 308-314.

In this case, however, the rank of a subject within the individual's array of interests was compared with his grade in that subject as compared with the grades of other students. Thorndike⁵ has, by a reworking of these data, shown that within an individual the correlation of interest in subjects and tested ability in them is about as high as he had formerly found it to be. The correlation of interest with self-estimated ability is higher than that with measured ability.

The general conclusion of these studies seems to be that relative interest closely reflects the hierarchy of abilities within an individual, but does not so accurately indicate his capacities as compared with others. The individual is likely to be most interested in what he can do best. But this "best" may be inferior to the work of others who in general may be less interested in that subject.

Fryer⁶ gave intelligence tests to men in a Y. M. C. A. employment department, who also expressed their vocational interests. From data on the intelligence of workers in different occupations, estimates were made of the mental ability required for reasonable success in the vocations selected. The actual intelligence of the men could then be correlated with the intelligence requirements of the vocation of their expressed interest. The correlation was only .38. Moore⁷ applied engineering aptitude tests and engineering interest questionnaires to a group of design and sales engineers, finding a correlation of .50 between interest as thus determined and ability as thus measured.

⁵ E. L. Thorndike, "The Correlation between Interests and Abilities in College Courses," *Psychological Review*, Vol. XXVIII, 1921.

⁶ D. Fryer, "Intelligence and Interest in Vocational Adjustment," *Pedagogical Seminary*, 1923, Vol. XXX, pp. 127-151.

⁷ B. V. Moore, *Personnel Selection of Graduate Engineers*, Psychological Monographs, Vol. XXX, No. 138, 1921.

Proctor^s has compared the vocational interests and ambitions of high school pupils with the actual possibilities of employment, as shown by the numbers of people engaged in various lines of work in the United States. He writes:

Vocational opportunities, as shown by the United States census reports, are just about the reverse of the distribution of high school pupils' occupational choices. Agriculture and the mechanical and industrial arts engage the energies of 61.1 per cent of the gainful workers in the United States, and only 8.8 per cent of the high school pupils had ambitions looking toward these fields. Business and clerical employments enlist only 14.1 per cent of the gainful workers of the country; and yet 29.7 per cent of the high school pupils plan to enter these fields of effort. . . . In spite of . . . liberal interpretation of the term "professional," only 4.4 per cent of the gainful workers of the country are found to be engaged in professional services in this country. Nevertheless professional and unclassified divisions (of the table) include . . . 61.7 per cent of the total number.

Although it is a fact that the high school represents a rather highly selected group of young people from whose ranks the clerical, business and professional occupations are very largely recruited, it is apparent that by no means 91.2 per cent of high school pupils will find their way into these occupational fields. Furthermore for their own best good many of them should be directed toward the agricultural, mechanical and industrial fields.

The world's work, as indicated by the numbers of people engaged in its various branches, seems thus to be poorly adjusted to the vocational interests and ambitions which youth expresses. It is, however, well enough adjusted to

^sW. M. Proctor, "Psychological Tests and Guidance of High School Pupils," *Journal of Educational Research*, Monograph No. 1, June, 1921.

their array of actual abilities, as objectively measured. The British Industrial Fatigue Research Board ⁹ has compared the occupations of Londoners with the distribution of children of appropriate intelligence levels in the London schools. The results are shown in the following table.

OCCUPATIONS OF ADULTS COMPARED WITH DISTRIBUTION OF INTELLIGENCE AMONG CHILDREN IN LONDON

Vocational Category	Intelligence Quotient	Per Cent of Adults thus Engaged	Per Cent of Children of this Intelligence
Highest professional and administrative work	Over 150	0.1	0.2
Lower professional and technical work	130 to 150	3.0	2.0
Highly skilled work and clerical work	115 to 130	12.0	10.0
Skilled work, minor commercial positions	110 to 115	26.0	38.0
Semiskilled work, poorest commercial positions	85 to 100	33.0	38.0
Unskilled labor and coarse manual labor	70 to 85	19.0	10.0
Casual labor	50 to 70	7.0	1.5
Institutional cases, imbecile and idiot	Under 50	0.2	0.2

On the whole then it seems clear that the vocational interests are apt to outrun vocational talents, especially in the case of those of lower general ability. However permanent such interests may subjectively be, they are in large numbers of cases doomed to frustration. It is perhaps the part of vocational mental hygiene to recognize these facts as early as possible. High school pupils below average ability are destined, for the most part, to find ultimate oc-

⁹ *A Study in Vocational Guidance*, Report No. 33, 1926.

cupation at levels below their interests and ambitions in high school years. Those of better than average ability may be expected ultimately to approximate their early ambitions.

DIFFERENTIAL VALUE OF INTEREST ANALYSES

To what degree can the general inventory and balance of an individual's interests or dislikes be related to his general or special vocational fitness? To what extent does the expression of interests differentiate individuals with different kinds of occupational history, training, or distinction? Two investigations of such questions may be briefly reported.

Among other results, Moore found that expressed interest in other vocations could be made to yield data which rather definitely differentiated men of the engineering and sales type. Thus among insurance salesmen 56 per cent marked bank cashier as an occupation they would like, and 29 per cent marked it "disliked." But among design engineers 29 per cent "liked" and 46 per cent "disliked" this work, thus reversing the results from the salesmen. Carpentry was mainly "disliked" by the salesmen, while more engineers liked than disliked it. Not all occupations were thus differential. Thus only 18 per cent of each group "liked" the work of a sculptor.

The ten "salesman type" occupations that were most differential were bank cashier, automobile salesman, popular magazine editor, hotel keeper or owner, lawyer, reporter, private secretary, purchasing agent, real estate agent, stockbroker. The differential "engineering type" preferences were architect, automobile repairman, carpenter, draftsman, government astronomer, machinist, pattern

maker, toolmaker, watchmaker, research worker in physics. Follow-up study of the later work of some of these men suggested that 85 per cent of them would have been correctly placed in the successful line of work by the original and complete "interest analysis," of which this was a part.

A study by Cowdery¹⁰ "uses a modified form of the Carnegie Institute of Technology Interest Analysis Blank, varies the statistical treatment of responses, and evaluates the returns secured from selected groups of doctors, engineers and lawyers." If a response was given by a larger proportion of medical than of non-medical men, this response was given a positive "medical item-score" and weighted according to its degree of preponderance. Critical items thus selected were combined into "scales" for the three professions. By such means it was found possible, by an inventory of expressed interest in a motley array of items, to classify individuals in their respective professional groups with 80 to 90 per cent accuracy. Groups of university students preparing for these three professions were examined and the interest lists were found to differentiate these groups with a high degree of accuracy.

The most recent and elaborate studies in this field of interest analysis are those of Strong.¹¹ Using the interest blank just described, he has secured data from eighteen or more occupational groups.

What is measured is the degree of similarity or dissimilarity between a man's interests and those of the average member of a given occupational group. . . . Thus if a blank

¹⁰ K. M. Cowdery, "Measurement of Professional Attitudes," *Journal of Personnel Research*, 1926, Vol. V.

¹¹ E. K. Strong, Jr., "An Interest Test for Personnel Managers," *Journal of Personnel Research*, 1926, Vol. V.

is being scored for banking interest, and the item "children" is marked as "liked," that item receives a score of 0 because bankers and men in general like children in 80 per cent of the cases. But if the item "penmanship" is "liked," that item is scored (+ 7) because 69 per cent of bankers like penmanship and only 38 per cent of men in general do so.

By a further system of scaling and grading these interest returns it is shown that personnel managers, for example, may be differentiated from others by their expressed likes and dislikes, and that their overlapping with other groups may also be used to indicate certain similarities of these groups in their attitudes.

Comparison of these differential lists of vocational interests suggests that the actual interests of the men were in certain *kinds* of work, rather than definitely in particular jobs. Instances of such general kinds of work are working with raw materials, with animals, with plants, with tools, with other people, with children, manipulating simple symbols, as in records and computations, or with subtler symbols, as in dealing with ideas. Other instances are afforded by such broad terms as teaching, selling, inventing, managing, farming, banking, business, art, engineering.

It is probably only such general dispositions that the various forms of interest analyses can reveal in any formal or calculable way. We are still far from knowing the origin, conditions, and stability of even these vague inclinations, since human vocations involve so much more than their purely esthetic aspects.

CHAPTER XIV

THE SCHOOL CURRICULUM AS A VOCATIONAL TEST

FUNCTIONS OF THE CURRICULUM

With certain qualifications the work of the school curriculum may be said to constitute an elaborate mental test. One important function of the curriculum is that of selecting and identifying individuals who possess a certain type of mental alertness or patience. Another function is that of supplying the individual with certain implements, facts, and ideas, certain subject matter, which may or may not be of direct value in his later life but which is at least in this way perpetuated and preserved. A third function is that of affording opportunity for the exercise of such specific or general abilities as the curriculum may call into play.

All three of these functions have more or less direct vocational relevance. In the hands of industrial and technical interests, subject matter becomes more and more prominent as the important item. As this happens the older idea of discipline and exercise becomes subordinate or implicit. But, whatever be the underlying educational philosophy, the selective value of the curriculum is an inescapable fact. The school system, by its processes of grading, promotion, and certification, tends always to mark off as a distinct group those individuals who can and will meet its demands. It also attempts to differentiate

the members of this group from one another on the basis of their ability or their inclination. The high schools, colleges, professional and technical courses continue this process of elimination, identification, and selection. According to the student's ability and inclination to satisfy the requirements of the curriculum, he or she is dropped, graded, retarded, promoted, or passed with honors.

Extending, as it commonly does, over many years of the individual's life, conducted by a considerable number and variety of examiners, and presented in a diversity of forms and methods, school work constitutes a type of mental test which is unequaled in its completeness. It is highly important for vocational psychology to ascertain the degree of correlation between the individual's record in the curriculum test and his success or fitness in later life. To what degree is the individual's academic record prognostic of his industrial, domestic, and professional future?

PREDICTIVE VALUE OF SCHOOL RECORDS

As definite as this question is and as easy of solution as it may seem, it is only recently that reliable data, as distinguished from unsupported opinions, have begun to be accumulated. The problem is complicated by the difficulty of securing satisfactory measures of success in later life, and by the difficulties encountered in following up the careers of those individuals whose early records are known. Shall success be measured by the obstacles overcome, the income earned, the sacrifices made, the social usefulness accomplished, the amount of local and contemporary publicity received, the public recognition accorded, the scope of activities attempted, or the historical emi-

nence merited? And if more than one of these elements are to be considered, how are they to be treated commensurately? Certainly success may be achieved in any or several or all of these and other forms. For the present our information is limited to a few studies in which one or other of these aspects has been treated separately. As work in this field progresses we may be better able to sum up all the partial results into a statement of the general tendencies.

For our present purpose it may be best to bring together from various sources the data bearing on certain specific questions which have been propounded which are distinctly relevant to the work of vocational psychology.

I. *With respect to school work itself, what relation exists between the early success in elementary subjects and the later success in handling more advanced subject matter?* This question is important to all those who may be concerned in advising individuals concerning the desirability and probable profit of continuing their school experience, and of entering occupations in which scholastic abilities may be requisite.

Kelley has reported a careful study of the relation between the marks in the fourth, fifth, sixth, and seventh grades and the marks received in the first year of high school work. The results, in the case of fifty-nine pupils followed through the six years, were as follows:

CORRELATION BETWEEN MARKS IN THE GRADES
AND MARKS IN FIRST HIGH SCHOOL YEAR

7th grade .....	.72
6th grade .....	.73
5th grade .....	.53
4th grade .....	.62

His study further seeks to show the relative weight to be attributed to the work of each grade, by applying a formula known in statistics as a "regression equation."

The net conclusion which may be drawn from these coefficients of correlation is that it is possible to estimate a person's general ability in the first year [H. S.] class from the marks he has received in the last four years of elementary school with accuracy represented by a coefficient of correlation of .789, and that individual idiosyncrasies may be estimated, in the case of mathematics and English, with an accuracy represented by a coefficient of correlation of .515. . . . Indeed, it seems that an estimate of a pupil's ability to carry high school work when the pupil is in the fourth grade may be nearly as accurate as a judgment given when the pupil is in the seventh grade.

Miles finds that the correlation between the average elementary school grade and the high school grade is .71. Dearborn also finds that high school efficiency is closely correlated with success in university work. He studied various groups of high school students, the groups containing from 92 to 472 students each. These were grouped into quartiles on the basis of high school standing, and compared with similar classifications on the basis of university work. Dearborn summarizes his results thus:

We may say, then, on the basis of the results secured in this group (472 pupils) which is sufficiently large to be representative, that if a pupil has stood in the first quarter of a large class through high school the chances are four out of five that he will not fall below the first half of his class in the university. . . . The chances are but about one in five that the student who has done poorly in high school—who has been in the lowest quarter of his class—will rise above the median or average of the freshman class at the

university, and the chances that he will prove a superior student at the university are very slim indeed. . . . The Pearson coefficient of correlation of the standings in the high schools and in the freshman year, for this group of 472 pupils, is .80. . . . A little over 80 per cent of those who were found in the lowest or the highest quarter of the group in high school are found in their respective halves of the group throughout the university. . . . Three-fourths of the students who enter the university from these high schools will maintain throughout the university approximately the same rank which they held in high school.

Lowell's investigation, which is discussed in later paragraphs, also bears directly on the question of the relation between college entrance records, college grades, and later work in professional schools. A rather different method of procedure was adopted by Van Denburg, who studied the relation between the first-term marks of high school pupils in New York City and the length of time the pupils continued in school work. The following table gives a general idea of his results:

SHOWING THE RELATION BETWEEN FIRST-TERM MARKS IN HIGH SCHOOL AND THE LENGTH OF TIME PUPILS REMAIN IN SCHOOL (VAN DENBURG)

First Term Mark, Per Cent	Percentage Leaving School in Various Years after Entrance into the High School		
	Left during First Year	Left in 2nd, 3rd, or 4th Years, or Failed to Graduate in 4th	Graduated
Below 50	61	39	0
50 to 59	49	46	5
60 to 69	39	58	3
70 to 79	20	62	18
80 to 89	17	46	37
90 to 100	6	40	54

Thorndike, in referring to the significance of such results, says:

Ten times as many of those marked below 50 leave in the first year as of those marked 90 or above. Of 115 pupils marked below 50 not one remained to graduate in four years. As the marks rise the percentage leaving in the early years steadily falls and the percentage graduating rises. Such prophecies . . . could easily be worked out for any community. They show that in the important matter of the length of stay in school a pupil's career is far from being a matter of unpredictable fortuity. . . . It will not be long before [we] will remember with amusement the time when education waited for the expensive tests of actual trial to tell how well a boy or girl would succeed with a given trade, with the work of college and professional school, or with the general task of leading a decent, law-abiding, humane life.

Prompted by Dearborn's study of the relation between work in high school and work in the university, Smith made a somewhat more intensive study of a group of students in the University of Iowa. Dearborn had investigated the academic careers of pupils from eight large and four small high schools in Wisconsin, and concluded that three-fourths of the students entering the university from these high schools would maintain throughout the university approximately the same rank as they had held in high school. When the groups were divided into upper and lower halves, about 70 per cent of those in the upper high school section were found in the upper half of the university section; about the same number of those in the lower high school half were found in the lower university half.

Smith's data showed almost precisely the same figures

as those of Dearborn. From the Liberal Arts class of 1910 (160 students) those were chosen whose records were complete in both high school and university. This gave a total of 120 students. On the basis of their standing, as based on the grades assigned in all subjects studied, they were ranked in order for each year of high school and university. They were then separated into quintiles on the basis of these rankings, and their standing in these various quintiles observed from year to year.

When the students, on the basis of their general high school average (for the four years), are distributed through their respective quintiles in the university (general average again) the results are as shown in the following table.

SHOWING THE RELATIONS BETWEEN HIGH SCHOOL RECORDS AND UNIVERSITY RECORDS (SMITH)

High School Average	University Average				
	1st Quintile	2nd Quintile	3rd Quintile	4th Quintile	5th Quintile
1st Quintile	54%	17%	17%	4%	8%
2nd Quintile	25%	29%	17%	13%	16%
3rd Quintile	17%	25%	20%	21%	17%
4th Quintile	0%	25%	25%	33%	17%
5th Quintile	4%	4%	21%	29%	42%

In considering this table it is apparent that if the high school students were distributed through the various university quintiles on a purely chance basis, and without any reference to their high school records, there would tend to be 20 per cent of each high school quintile in each of the university quintiles. Any percentage higher than this 20 per cent thus indicates some significant relation between the two sets of grades. On the whole there is a

close relation indicated. The tendency is clear for those in a given high school quintile to be found in or near the same quintile in their university work. The relation is particularly close in the highest and lowest quintiles. In the intermediate quintiles there is more or less shifting about.

In the same way it is possible to classify all students in quintiles during their first high school year, and then to trace their careers through the following three years of high school and four years of college. The following tabulation shows the results when this was done. The figures show the percentage of each quintile in first year high school who were found in the same quintile in the various later years.

SHOWING THE RELATION BETWEEN RECORDS IN THE FIRST HIGH SCHOOL YEAR, AND RECORDS IN SUBSEQUENT YEARS IN HIGH SCHOOL AND COLLEGE (SMITH)

Quintiles	High School				University			
	1	2	3	4	1	2	3	4
First	100%	70%	67%	67%	52%	36%	43%	25%
Second	100%	54%	33%	29%	35%	33%	22%	8%
Third	100%	41%	37%	21%	35%	20%	22%	21%
Fourth	100%	29%	25%	21%	48%	28%	17%	25%
Fifth	100%	50%	59%	50%	45%	32%	39%	38%
AVERAGES ..	100%	49%	44%	38%	43%	30%	29%	23%

Here again, if the subsequent distributions were on a chance basis with respect to the first year high school grades, there would tend to be but 20 per cent in each of the various quintiles. As a matter of fact, the percentages never fall so low as 20 per cent, although in the senior college year they approach very close to this figure.

It is to be noted that changes so small as from one quintile to the immediately adjacent one are not taken into account in this table. The figures show only those who were in precisely the same quintile all the way through. The indication is then that a student's performance in the first high school year is very significant of what his performance will be through the rest of the high school course, and also of significance with respect to what he will do in his university work. The significance of the early work, as has appeared in other studies also, becomes less and less the farther through the course one goes, so that in the senior year in college there is approximately a chance distribution with reference to the work of the first year high school.

Smith also presents his results in the form of coefficients of correlation between various rankings. The following are the most interesting in the present connection:

CORRELATIONS (SMITH)

High school average and university freshman average...	.48
High school average and university sophomore average..	.39
High school average and university junior average.....	.47
High school average and university senior average.....	.28
1st and 2nd year high school.....	.77
1st and 3rd year high school.....	.67
1st and 4th year high school.....	.66
University freshman and sophomore.....	.73
University freshman and junior.....	.61
University freshman and senior.....	.45

These figures of course indicate the same facts as those derived from the previous methods of expressing the data. The high school average correlates throughout with the college ranking, the correspondence becoming less appar-

ent in the later college years. Similarly, the good students in the first high school year are the good ones all through the high school course, and the able college freshmen are able as sophomores, juniors, and seniors. But both in high school and in college the significance of early standing becomes less and less as the years progress.

A. L. Jones¹ compared college entrance examinations with work done later in the college course, in the freshman and sophomore years. Two hundred men from the entering classes of 1907, 1911 and 1912, in Columbia College, were selected for study. These men were arranged in four groups, fifty in each group, on the basis of (a) their marks in entrance examinations, (b) their college marks in the first and second college years. Group I contains the best fifty individuals, Group II the fifty next best, etc. The following compiled table shows where the members of each group in entrance examinations stood in their college work:

SHOWING RELATIONS BETWEEN ENTRANCE RECORDS AND COLLEGE
STANDING (JONES)

On Basis of Entrance Examinations	On Basis of Freshman Ranking			
	Group I	Group II	Group III	Group IV
Group I (50 men) ..	30	13	5	2
Group II (50 men) ..	16	17	12	5
Group III (50 men) ..	3	13	16	18
Group IV (50 men) ..	1	7	17	25
	On Basis of Sophomore Ranking			
	Group I	Group II	Group III	Group IV
Group I (13 men) ..	7	4	2	0
Group II (13 men) ..	4	5	2	2
Group III (13 men) ..	2	4	3	4
Group IV (14 men) ..	0	0	6	8

¹ *Educational Review*, September, 1914.

It appears from this table that there is a fairly well-marked tendency for the men to remain in the group in which they start. At least the larger number of men are found in college in about the same group in which they occurred on the basis of entrance examinations. Jones writes:

It is evident from an examination of these . . . data that entrance examinations, aside from other important uses claimed for them by their advocates, may fitly be taken as an important indication of the future career of the candidate for admission. They should of course be supplemented, and so should any other means of determining preparation for college. Those who have studied the question tell us that there is a high degree of correlation between intellectual qualities and others. A good test of intellectual fitness is, therefore, in some degree a test of other qualities also. Entrance examinations have their imperfections but there can be no doubt that they may serve as a solid foundation on which to build.

Thorndike, on the other hand, in studying the relation between entrance marks and later college standing (Columbia College classes entering in 1901, 1902 and 1903), finds results which lead him to say:

The important facts concerning the relationship of success in entrance examinations to success in college work . . . prove that we cannot estimate the latter from the former with enough accuracy to make the entrance examinations worth taking or to prevent gross and intolerable injustice being done to many individuals. . . . The records of eleven entrance examinations give a less accurate prophecy of what a student will do in the latter half of his college course than does the college record of his brother! The correlation between brothers in intellectual ability is approximately .40,

but that between standing in entrance examinations and standing in college of the same person is only .47 for junior year (130 cases) and .25 for senior year (56 cases). . . . From many facts such as these . . . it is certain that the traditional entrance examinations, even when as fully safeguarded as in the case of those given by the College Entrance Examination Board, do not prevent incompetence from getting into college; do not prevent students of excellent promise from being discouraged or barred out altogether; do not measure fitness for college well enough to earn the respect of students or teachers; and do intolerable injustice to individuals.

The apparent striking contradiction between these two reports is not, however, so serious when it is noted that the records of Jones were taken from freshman and sophomore years, while Thorndike's, as here quoted, were taken from junior and senior years. Thorndike has also presented, in another connection, comparisons of entrance examinations with the work of freshman and sophomore years, and in these cases his correlations are considerably higher, more nearly approximating the results of Jones. The correlations, for the four college years, were as follows: freshman year, .62; sophomore year, .50; junior year, .47; senior year, .25.

Apparently the only safe conclusion is that the entrance examinations are fairly useful in predicting the early college work, their prognostic value becoming less and less as the interval between the two measures is increased. It is now a very common practice for colleges to supplement the academic history and entrance examinations of candidates for admission by specially devised psychological tests. These often measure present academic information and general knowledge, as well as general intelli-

gence. The Brown University Tests and the Thorndike Tests for High School Graduates are well-known series of this kind.

SCHOOL RECORDS AND VOCATIONAL SUCCESS

II. *Is there any relation between general or particular academic aptitude or inclination and general or particular proficiency in the subsequent domestic, industrial, commercial, professional or civic activities?*

This question is of importance not only to the individual and his guide but also to employers, agencies, and society at large.

An interesting and significant study bearing on this question has been reported by Nicolson, who investigated the relation between academic success and prominence in later life. The men graduating from Wesleyan University during the years 1833 to 1899, 1,667 in number, were arranged in three groups. In the first group were the 140 "honor" men, who were valedictorians or salutatorians of their classes. In the second group were placed all the men elected to Phi Beta Kappa, on the basis of high scholarship. Of these there were 461. In the third group were placed the remaining 1,206 men. It was then determined how many of these men were found in the current edition of *Who's Who*, or were judged, by faculty or fellow students, as having been or about to be of sufficient distinction to be included in such a directory. The results are given in the tabulation on the following page.

Referring to these results, Nicolson makes the following comments:

From this study of the careers of sixteen hundred and sixty-seven graduates, living and dead, where three different

SHOWING THE RELATION BETWEEN COLLEGE HONORS AND INCLUSION IN *Who's Who* (NICOLSON)

643 Students, of the Years 1833-1859	Per Cent Judged by Faculty to be of <i>Who's Who</i> Rank
Honor Men (53)	50
P.B.K. Men (167)	32
Remainder (476)	6
604 Students of the Years 1860-1889	Per Cent Found in 1914-15 Edition of <i>Who's Who</i>
Honor Men (59)	48
P.B.K. Men (185)	31
Remainder (419)	10
420 Students of the Years 1890-1899	Per Cent in <i>Who's Who</i> or Judged by Classmates as about to be There
Honor Men (28)	50
P.B.K. Men (109)	30
Remainder (311)	11
Total of 1667 Students	Per Cent with Distinction Entitling to Inclusion in <i>Who's Who</i>
Honor Men (140)	50
P.B.K. Men (461)	31
Remainder (1206)	9

methods are employed in determining distinction in after life, it appears that the results are fairly constant, and we are justified in assuming that, for this college at least, the chances of distinction for a high honor graduate, one of the two or three leading scholars of the class, are just even; that one out of three of those elected to Phi Beta Kappa is likely to achieve pronounced success in life; and that each of the remaining members of the class has less than one chance in ten to become famous. In other words, roughly speaking, the quarter (or the fifth) of the class elected to Phi Beta Kappa are likely to supply just as many distinguished men as are the remaining three-quarters (now four-fifths) of the class.

The study of Nicolson includes only that type of success which would be likely to lead to inclusion in *Who's Who*, viz., the more strictly literary, professional, political, and academic success. The commercial, industrial, and business careers are not so likely to lead to inclusion in this directory, and yet success in them is no less definite than in the professional work. It is rather difficult to determine the degree to which success in these fields is determined by ability alone, and to what degree it is a function of chance, inheritance, social charm, prestige, and geographical and economic circumstance. Nevertheless it would be interesting to know whether such measure of success as can be secured in the fields of finance, commerce, and industry correlates in any way with success in the work of school years.

In a study of the graduates of Pratt Institute the grades achieved by students in the courses in mechanical engineering and electrical engineering were compared with the salaries the men were receiving several years after graduation. There were in all six classes of men, numbering about forty each—three classes from mechanical engineering and three from electrical engineering, for the years of 1907, 1908, 1909. The salary reports were asked for in 1913, four to six years after graduation of these classes.

The men were ranked according to the grades they received in the eight different subjects included in the curriculum, the grades being 10, 9, 8, and 7, corresponding to the ordinary grade system of A, B, C, D. They were then ranked according to the salary reported at the time of the investigation. Results for each class were treated separately so that the time elapsing since gradu-

ation was not a factor in the results. The following table gives the results when these two rankings were correlated by two statistical methods of computing correlation.

SHOWING THE CORRELATION BETWEEN SCHOOL STANDING AND SALARIES EARNED IN LATER LIFE

Class and Year	Cases	Correlation by Pearson Method, and P.E.		Correlation by per Cent of Unlike Signs, and P.E.	
Mechanical '07.....	35	.36	.08	.22	.09
Mechanical '08.....	41	.25	.09	.34	.08
Mechanical '09.....	39	.21	.09	.06	.10
Electrical '07.....	26	.16	.13	.25	.12
Electrical '08.....	36	.46	.08	.51	.08
Electrical '09.....	41	.16	.10	.28	.09
AVERAGES.....		.267		.277	

In every case the correlation between grades and salary is positive, although the coefficients are all small. This means that in the long run there is a general tendency for the good salaries to go to the men whose grades were high, but that there are many exceptions to the rule. Certainly in no class is the opposite tendency shown, for the good salaries to go to the poor students. It is probable that the correlations found here are as low as they are partly because in this technical school there is no special effort made to encourage high grades for their own sake, the emphasis being rather on getting a good average rating.

Just what these degrees of correlation mean is made somewhat more apparent if we treat the data in another way. If instead of computing coefficients of correlation

we divide each class of men into four quartiles, and determine the average salaries of the men in these quartiles, we get very definite results. The upper quartile or group will now contain that fourth of the class whose grades were highest. The second, third, and fourth quartiles will in turn represent decreasing degrees of academic proficiency. If the average salaries are the same for all quartiles, this will mean that there is no relation between salary and school grades. But if the salary varies with the grades, this will be a significant result. The actual data are as follows:

DATA PRESENTED IN A REVISED FORM

Class and Year	Cases	Average Salaries of the			
		1st Quartile	2nd Quartile	3rd Quartile	4th Quartile
Mechanical '07....	35	\$1800	\$1675	\$1362	\$1387
Mechanical '08....	41	1450	1512	1512	1275
Mechanical '09....	39	1375	1262	1313	1137
Electrical '07.....	26	1750	1675	1675	1412
Electrical '08.....	36	2147	1437	1262	1262
Electrical '09.....	41	1462	1212	1387	1200
AVERAGES		\$1664	\$1462	\$1418	\$1279
PERCENTAGES ...		100	87	85	76

If the separate classes be now considered the results are seen to be more or less irregular, although the general tendency is apparent. If the average results from all six classes are considered the results are more reliable as well as more uniform. The average salary varies in the same way as do the grades. If the average salary of the men of the first quartile (\$1,664) be taken as a basis of com-

parison and considered 100 per cent, then the salaries of the men in the second, third and fourth quartiles are respectively only 87, 85, and 76 per cent of this amount. In general terms, the salary of the men in the lower or poorest quarter of the class, from the point of view of school grades, will be only three-fourths the salary of the men in the upper or best quarter. The two middle quartiles will differ but little from each other, although the second has the advantage, by 2 per cent, or \$44, over the third quarter.

If the class be divided into a better and a poorer half, then the average salary of the men in the upper half is seen to be \$1,563, while that of the men in the lower half is only \$1,348. The men in the upper half earn \$215 more in a year than the men in the lower half. This way of expressing the results is both clearer and more concrete than the mere statement of the coefficient of correlation.

Interesting data on all three of these preceding questions are to be found in A. Lawrence Lowell's study of the academic careers of students in Harvard College, Law School, and Medical School. This investigation included an examination into the college entrance examinations, the records attained during the college course, the subjects elected in this course, and the subsequent achievement of the men in the professional schools of law and medicine.

Lowell's statistics cover the cases of all men who took the degree of A. B. at Harvard and then graduated from one of the two professional schools connected with Harvard. Only men who had taken at least three years of college work in residence were included. The records for

the Law School cover the twenty years from 1891 to 1910. Those for the Medical School cover the sixteen years from 1895 forward.

The college gives degrees indicating four grades of distinction on the basis of scholarship. These are indicated as "plain," "*cum laude*," "*magna cum laude*," and "*summa cum laude*." The two professional schools grant degrees with two grades of distinction, *viz.*, "plain" and "*cum laude*."

Lowell assumes that the grade attained on the college entrance examinations indicates with a certain degree of correctness the natural scholarly abilities of the student. The course of studies elected during college reflects roughly the general interests of the student at that time. The college records indicate his ability in the pursuit of those studies, including under ability such things as persistence, patience, fidelity, zeal, as well as native intelligence. The records in the professional schools are taken as indicating quite approximately the student's real ability to achieve success in the particular professional work of the technical sort.

All students are consequently classified according to these various factors. The entrance examinations are divided into "clear" and "conditioned." The college degrees and the professional degrees are classified on the basis of the degree of distinction awarded. All students are also classified on the basis of their election of the four possible college courses: (*a*) literature and languages; (*b*) natural sciences; (*c*) history and political science; (*d*) philosophy and mathematics. The relations between these various classifications are then presented and analyzed in various ways.

Thus it is shown that there is very little or no relation between the college course elected and the probability of achieving a degree *cum laude* in the professional schools. The figures in Lowell's study are summed up in the following table:

SHOWING RELATION BETWEEN COURSE ELECTED IN COLLEGE AND HONORS RECEIVED IN SUBSEQUENT YEARS IN PROFESSIONAL SCHOOLS (LOWELL)

Course Pursued	Degree in Law School		Degree in Medical School	
	Plain	<i>Cum Laude</i>	Plain	<i>Cum Laude</i>
Lit. and Lang.	801	180 (18.4%)	145	166 (53.4%)
Nat. Science	19	3 (13.6%)	75	81 (51.9%)
Hist. and Pol. Sci.	627	129 (17.1%)	30	20 (44.4%)
Phil. and Math....	8	11 (57.9%)	6	7 (53.8%)

The figures suggest that "as a preparation for the study of law or medicine it makes comparatively little difference what subject is mainly pursued in college." That is to say, college interest in natural sciences, as indicated by the election of that course, does not indicate special aptitude for the work of medicine; nor does the election of courses in history and political science indicate a necessary superiority in the more or less related work of law. Lowell shows that only during the first year or so of the Medical School do those who have already specialized in natural sciences have any advantage over those medical students who have specialized in other subjects.

What is the relation between the men's records in college and their achievement in the professional schools? In the following table are given the number of college

men of each degree of distinction who were awarded *cum laude* in the professional schools:

SHOWING RELATION BETWEEN COLLEGE HONORS AND HONORS IN
THE PROFESSIONAL SCHOOLS (LOWELL)

Record in College	Awarded <i>Cum Laude</i> in Law	
	Number	Per Cent
609 Plain degree	40	6.6
305 <i>Cum laude</i>	68	22.3
200 <i>Magna cum laude</i>	80	40.0
33 <i>Summa cum laude</i>	20	60.0
	Awarded <i>Cum Laude</i> in Medicine	
239 Plain degree	86	36.0
85 <i>Cum laude</i>	65	76.5
39 <i>Magna cum laude</i>	34	87.2
2 <i>Summa cum laude</i>	2	100.0

It is apparent at once that there is a close relation between the college records and the records in the professional schools. Both in law and in medicine those who are awarded honors tend largely to be those who were awarded honors in college. And the higher the college honors, the greater the percentage of men receiving honors in the professional schools.

We may now ask how far back in the academic careers of these men it is possible to predict their probable achievement in the professional schools. Have those who are awarded the professional honors already distinguished themselves from their fellows at the time of their entrance into college? The following summary of the results presented by Lowell in much more detail will help answer this question:

SHOWING RELATIONS BETWEEN VARIOUS ACADEMIC RECORDS
(LOWELL)

Academic Record	Per Cent Men Graduating from the Graduate School and Receiving <i>Cum Laude</i>	
	In Law	In Medicine
Entered college "clear".....	26.4	59.1
Entered college "conditioned"	9.0	43.0
Graduated from college with distinction ..	31.2	80.1
Graduated from college without distinction	6.5	36.0
Entrance clear and college distinction....	37.9	78.1
Entrance conditioned and college with distinction	18.1	84.6
Entrance clear and college without distinction	11.1	42.4
Entrance conditioned and college without distinction	2.9	31.4

Here the result is clearly suggested that early merit in academic work means success in the professional schools, whether one considers entrance examinations or college records. And the most probable group for professional honors is made up of those men who combined both entrance and college distinction. This is especially striking in the case of the Law School. In the case of the Medical School the differences are not quite so great, although the general tendency is quite the same. This is said to be due to the lower standard required for medical honors during these years. Lowell concludes: "The men who are destined to take the highest rank in the law and medical schools are markedly better scholars, both in the preparatory schools and in college, than their fellows. In intellectual power, as in other things, the boy is father to the man."

Data are also available concerning academic and athletic success in the Military Academy at West Point, and subsequent success in military or civil life.² The records of over four thousand graduates, from 1818 to 1905, were examined, and class standing indicated by the quarter of the class to which the man in each case belonged. Military "success" was taken to mean appointment to the grade of Brigadier-General or better. For civil "success" the criterion was "approximately that required for inclusion in *Who's Who*." The following adapted table shows the most significant findings.

RELATION BETWEEN ACADEMIC AND ATHLETIC SUCCESS AND
SUCCESS IN AFTER-LIFE

Scholarship Standing	Per Cent Successful	Per Cent Dismissed	Per Cent Awarded Athletic Honor
1st quarter	32.5	18	20.9
2nd quarter	26.7	16	26.9
3rd quarter	23.4	27	26.3
4th quarter	17.4	39	25.9

The men in the first or best quarter of the class are here seen to have been "successful" about twice as often and "dismissed" for ignominious reasons only about half as frequently, as those in the fourth or poorest quarter. There is no striking relation between scholarship and athletic distinction. Nor was any relation found between athletic achievement and success in later life. Of the men

² Major Wm. E. R. Covell, "Relation of Class Record to Success," *Military Engineer*, January-February, 1924; and A. T. Poffenberger, "School Achievement and Success in Life," *Journal of Applied Psychology*, March, 1925.

awarded high athletic distinction ("A" men) 12 per cent became distinguished in later life. This is precisely the proportion for the class as a whole.

In a review and elaboration of this study, Poffenberger³ draws the following conclusions from the data: "(1) That the higher a man stands in college, the greater is his expectancy of success in later life; (2) That a man in the lower part of the class is more apt to become a moral failure than a man in the upper part; (3) That class standing is no criterion of athletic ability; (4) That an athlete has the same expectancy of success and no more than any other man in the class."

The most detailed analysis of the relation between college achievement and vocational success is that of Gambrill.⁴ In addition to a survey of the studies made up to that time, Gambrill conducted a series of comparisons of college achievement of various kinds with salaries or income some years after graduation, and offers interpretations of the results. The correlation between marks and income was on the whole positive but very low. Extra-curriculum activity was found somewhat more closely related to subsequent income than was scholarship. The relation of college to vocational decision was found to be slight: at least two-thirds of the college graduates choose their vocations before or after the college period, and the records show a great deal of occupational change. Such comparisons are of course very complicated, since the students were from several different colleges, entered work in different parts of the country, in different fields, and with different foundations in the way of capital,

³ Poffenberger, *op. cit.*, p. 28.

⁴ Bessie Lee Gambrill, "College Achievement and Vocational Efficiency," *Teachers College Contributions to Education*, No. 121, 1922.

family influence, and numerous other features. And of course no claim was made that income is a measure of success or achievement.

Better basis of comparison might be found if large numbers of individuals working for the same concern, under continuous management and policies of remuneration, could be studied. An analysis of this general character has recently been made, a summary of which will serve to bring this long chapter to a close.

In a study reported by the president of the American Telephone and Telegraph Company of college graduates employed in the Bell System, comparisons were made of the standing of the men in their college classes and of their salaries in this business at various times after graduation. After the first five-year period, men graduating in the first third of their college class were found to be earning distinctly more than the typical salaries for men of that period of service. After fifteen years this advance was about 10 per cent, and such men, who had been out of college thirty years, were earning 20 per cent better than the typical salary. In the case of the smaller group graduating in the highest tenth of their class, the facts were even more striking; the advance in salary amounted to 20 per cent after fifteen years and after thirty years to nearly 60 per cent. There were, of course, individual exceptions, but the evidence was clear that men ranking high in college studies were earning definitely larger salaries, on the average, and the higher the standing the larger the salary.

In the case of the men with inferior college records the facts were much the same, although the striking difference did not appear at so early a point in their career.

Mr. Gifford,⁵ who reports the study, concludes: "On the whole the evidence is very striking that there is a direct relation between high marks in college and salaries afterward in the Bell System."

Such results, in the field of business, tend strongly to confirm the previous suggestions from other data. They do not show that scholastic success is the chief determinant of success in later life; they do not even show that by giving diligence to his college work the individual student can win increased chances for business success. They do, however, suggest that the attitude the individual takes toward college work is likely to be characteristic of later efforts and that ability manifested in relative business success tends, in the case of college graduates at least, to show itself in earlier accomplishment with the academic curriculum.

Such figures do not reveal whether these differences among individuals are in the field of native intelligence, or in such traits and habits as earnestness, systematic methods of work, enthusiasm, and persistence. It is a noteworthy fact that the larger professional agencies of law and medicine choose their recruits, whenever possible, from among the men whose records in the professional school have been high. This tendency on the part of business enterprise has been less conspicuous, perhaps because of the conviction that the material content of college courses has little relation to the work of business. It may, however, yet be found that it is not the factual knowledge acquired nor the formal training experienced that is the most important vocational feature of academic study, but

⁵ Walter S. Gifford, "Does Business Want Scholars?" *Harper's Magazine*, May, 1928.

instead the prognostic value of such work in indicating the caliber of the individual's mind and attitudes.

On the whole, then, these studies all point in a consistent direction; those who are destined to achieve distinction and success begin to do so at an early age. Whether measured by achievement in academic courses, honors in professional or technical courses, salary earned after graduation, rate of advancement in one's occupation, or inclusion among lists and directories of eminent persons, success in later life is suggested by success in the early work of the school curriculum. In spite of frequent comments to the contrary, the school curriculum would seem to constitute a useful test in prognosticating at least the most probable quality of the individual's later work.

But our original questions are at present answered with very unequal reliability. With respect to the relation between early success or failure in elementary school subjects and success or failure in handling more advanced subject matter, the evidence is clear and definite. On the second question, concerning the relation between general or particular academic aptitude or inclination and general or particular proficiency in life's activities, the data, although consistent, are far from complete, and there are numerous complications. Here, then, as in so many other aspects of vocational psychology, we find an inviting field of research and an abundance of interesting problems.

CHAPTER XV

THE PSYCHOGRAPHIC METHODS: PROFILE AND JOB ANALYSIS

THE PERSONAL PSYCHOGRAPH

Another application of mental tests has a very direct interest for vocational psychology. This is the method of the "psychograph," as it is commonly called. Psychologists have been active in advocating the practice of submitting to careful and detailed experimental examination the physical and mental characteristics of men who have achieved marked success in their chosen vocations. By the application of this clinical method to men of superior attainment it is hoped that light may be thrown on the psychological foundations of their genius and, in general, on the relation between mental traits as shown in the results of psychological tests, and actual success in life's work. This psychographic method represents the earliest methodical attempt to differentiate the various vocations from one another on the basis of special aptitudes and characteristics, as distinguished from the factor of general intelligence.

Toulouse has published reports of such examinations or psychographs in the cases of Zola, Dalou, and Henri Poincaré. It is the intention to continue this line of work, utilizing from time to time such refinements of technique as may be available. As an illustration of the psychographic method in its earlier form an account of the

study of the eminent mathematician, Poincaré, may be given in some detail.

The investigation took account of such special topics as heredity, development, physical condition, sensory acuity, various kinds of memory, attention, imagery, function time, association of ideas, language and handwriting, character, habits, and opinions. Although the tests followed a technique which the investigator recognized to have been quite imperfect and fragmentary, they are said to have yielded results quite sufficient to characterize the intellectual type of the man. The account of the tests is followed by a synthesis in which is attempted a general picture of Poincaré's type and an interpretation of the conditions of invention and speculative genius.

THE ANALYSIS OF POINCARÉ

From the point of view of heredity, development, and general vital characteristics Poincaré was found to resemble most his mother and grandmother, who, with collateral relatives, are said to have shown special aptitude in mathematical calculation. Several male members of the family have had successful careers in neurology, law, meteorology, politics, and mathematics. Poincaré's development was not precocious, although he was bright and showed, when quite young, mathematical ability of an unusual order. His history, up the age of thirty years, at which time he was elected to the Academy of Sciences, was not unlike that of many other mathematicians whose freedom from the necessity of experiment allows them to make rapid progress. He was at one time troubled with rheumatism, and in his childhood suffered from an attack

of diphtheria, followed by paralysis. This attack is said to have profoundly modified his nervous system, perhaps providing the neuropathic basis for traits shown later in life, such as awkwardness, restlessness, flighty attention, distractibility, and general sensori-motor deficiency.

A physical examination which dealt mainly with anthropometric measurements, strength tests, and with an inquiry into habits of eating, sleeping, and the use of narcotics, revealed nothing very unusual. Poincaré had head measurements somewhat larger than the average. He was troubled with indigestion, also with insomnia. He did not use tobacco, and indulged only sparingly in wine and coffee. He was able to work for but four hours a day, in two-hour periods, and the tendency to automatisms and the perseveration of psychic activity compelled him to cease work for some time before retiring. He disliked muscular exercise except for the automatic processes involved in walking. His absent-mindedness was a matter of common comment among his associates. The examination of his sensory and motor capacity showed him to be rather feeble from a sensory point of view. Hearing was defective for low tones, but auditory orientation and localization were fair. He was shortsighted, but had no astigmatism; tests of the field of vision showed no abnormality. Muscular weakness of the eyes was present, which led to accommodation spasms. His general bodily movements were characterized by uncertainty, irregularity, awkwardness, and hesitancy, and his muscular reflexes were prominent.

The greater number of the tests had to do with more strictly mental characteristics. Poincaré had no visual images or memories, except in the transition state be-

tween waking and sleeping, when he had frequent visual hallucinations of remarkable distinctness. In his waking life he relied chiefly on motor images and tendencies, thinking of geometrical forms in terms of optical or manual movements. He had no visual "schemes," but represented time, in his thinking, by a rotation of the eyes on their axes. In his youth he had pronounced colored hearing, which was evoked not by the form but by the sound of letters and words. He had no other synesthesias. Tests of recognition memory for length of lines, reproduction of drawings seen once, etc., are said to have shown exceptional memory capacity. The memories were held with the aid of motor imagery, and the reproduction was often not from the image but on the basis of an analysis of the material which had been presented to him. He had a memory span for digits of about eleven, as compared with the ordinary record of about eight. In the case of letters he had an auditory memory span of nine, and a visual span of seven. Mechanical memory did not seem to be particularly good, and much emphasis is laid on his tendency to use memory devices when remembering this non-logical material; he employed analysis and incidental schemes whenever possible. He had a "remarkable facility in mental calculation," which is said not to be the rule with mathematicians. In tests of logical memory he was superior to both Zola and Dalou, and here again his memory was found to be analytical and artificial rather than mechanical. All material was arranged in a coherent scheme or system, and it was this system, rather than the material, that was remembered.

A series of cancellation and reaction-time tests showed that the simple sensory reactions were slower and more

regular than those of the average person, but the motor reactions were much quicker. This accords with previous indications as to Poincaré's general motor type. The most significant thing about the reactions is said to be the wandering and unstable attention which they disclosed. It was difficult to keep Poincaré's mind on the tests, because his attention constantly wandered to the apparatus. In receiving instructions for such experiments he did not seem to comprehend what was being said, but appeared distracted and uninterested. This is the same impression he is said to have given to those whom he met in his daily relations. He was restless, could not remain in one position or stay by one task, had no patience, and abandoned his work whenever it seemed to require any voluntary effort. Tests of reverie associations and of free paired associates showed absence of voluntary attention and predominance of purely verbal association tendencies. Binet's "cigarette description" test was used, and Poincaré was found to belong to Binet's first type of observer (simple description, with no evidence of reflection or judgment, no display of erudition, no expression of fancy or sentiment). His description was remarkably lucid and clear. He spoke correctly, never learned his addresses by heart, and made few corrections either in writing or in speaking. Indications of his temperament and type are said to be suggested by his handwriting.

Poincaré's opinions on various topics are given, and several peculiar habits of daily life are recorded, chiefly for the sake of emphasizing his constant air of distraction, his impatience and restlessness. He loved music; sketched a little; did not sleep soundly; and often began to work on a problem only to abandon it in the faith that it would

in some way solve itself unconsciously or that the right idea would come spontaneously on some later occasion. He often began a memoir without having any conclusion in mind. He often wrote formulæ automatically for the sake of the chance associations which they might bring.

These tests of Poincaré showed him to present a striking contrast to Zola, the novelist. Zola's type was found to be characterized by prominent voluntary intellectual activity, clearly conscious and intense, concentrated effort, with no tendency to perseveration of ideas after cessation of work. His thought, as disclosed by the tests, was logical, methodical, and seemed preëminently fitted for the work of mathematical deduction. His method of work was quite the opposite of that of Poincaré, who, when he met with a difficulty or with a point requiring voluntary effort, abandoned his work or proceeded to another part of it which would develop more spontaneously. The surprising thing was that a methodical, logical, and persistent worker, such as Zola, should have become the prince of romance that he was. One might have expected that the mental processes of Poincaré, which were shown to be flighty, uncontrolled, spontaneous, unstable, and spasmodic, would have particularly fitted him for the activity of the romancer. Instead, they found their outlet in severe mathematical and philosophical creation. Poincaré's genius is thus said to be incapable of explanation on the basis of his sensori-motor equipment, his imagination and memory, and the speed or control of his psychic activity. If his case is taken as typical, it suggests the quite unexpected result that tendency to distraction, automatisms, oscillating attention, restlessness, uncontrolled association, and reliance on chance syntheses and spontaneous ideas are

significant for the type of genius required in mathematics and philosophical speculation. Certainly in Poincaré's case they seem to have constituted a definite method of research.

The chief value of this examination of Poincaré does not lie in the particular results which it yielded, but in its initiation of such attempts to study in a more or less intimate and intensive way the psychological processes and type of individuals of marked achievement in special lines of work. For the purposes of vocational psychology it would be valuable to know the ways in which such admittedly superior individuals, differing as they do in their types of achievement, would react to the simple and complex tests employed in the measurement of intelligence and special aptitudes. It is true that these psychographic methods do not yet yield results which are sufficient to inform us why the particular individuals examined were so much more successful in their work than were others who seem to have been equally favored and equally diligent. Nor have they yet revealed in any adequate way the nature or degree of the qualifications requisite for success in the vocations from which the representative men have been selected. Nevertheless the individual psychograph constitutes a suggestive method of research for the vocational psychology of the future. It represents the intensive development of the older type of "biography," based on direct observational data rather than on hearsay, conjecture, and anecdote.

It is on some variation of this method that we must largely rely in our efforts to learn to what degree vocational success depends on the presence of demonstrable personal characteristics, rather than on the accidents of time,

place, and circumstance. It was inevitable that the first attempts to give psychographic accounts of the personality of individuals of genius should be more or less fragmentary, incomplete, and experimental. This has been due partly to the rapidity with which our knowledge of mental tests has developed, and partly to the very complex and subtle types of achievement toward which these early psychographic methods have been directed. Various investigations are now on record in which these same methods are being used in the intensive examination of individuals who have engaged in simpler and more common forms of activity, with varying degrees of success. In some of these researches, for example, men who have made their life work the marketing of a specific type of commodity through direct and personal salesmanship are being submitted to intensive psychological examinations. The problem is to discover whether there is a more or less specific and recognizable type of personality which characterizes the successful salesman and differentiates him from the mediocre salesman and the utter failure. Directed toward these more familiar and more easily accessible occupations, the individual psychograph constitutes one of the most interesting forms of vocational psychology. Closely related to it, though sufficiently distinct in aim and method to merit separate presentation, is the method of the vocational psychograph, in which the work, rather than the worker, is made the object of analysis.

THE VOCATIONAL PSYCHOGRAPH

Closely related to the method of intensive examination described in the preceding section, and profitable in a somewhat different direction, is the type of psychograph

represented in Seashore's reports on "The Measurement of a Singer." This may be called the "vocational psychograph" as contrasted with the psychograph of the individual of genius. It proceeds by discovering first the necessary abilities and capacities which a given sort of performance demands. In the case of singing, rather more than in almost any other vocation, certain definite and fairly identifiable abilities are quite obviously required, and the degree to which they must be present for definite attainments is rather more easily discoverable.

Thus, Seashore writes:

Musical power is generally admitted to embrace certain well-recognized and fairly concrete capacities. In our commonplace judgments about ourselves and others we say: "I have no ear for music." "I cannot tell a chord from a discord." "I cannot keep time." "I have no sense of rhythm." "I cannot tell a two-step from a waltz." "I cannot remember music." "I cannot image sounds." "I am not moved by music." "I do not enjoy music." Or, if speaking of someone who has musical ability, we say: "He has a deep, rich voice." "He never forgets an air." "He lives in song." Such judgments have reference to generally admitted specific factors involved in musical capacity by virtue of a musical organization. Corresponding to these judgments of native capacity we have judgments about musical education, about musical environment, about special influences and stimuli for the development of musical talent, and about technique and success in the rendition of music. When judgments of this kind are based upon measurements, classified and adequately interpreted, they may constitute a measure of the individual as a singer.

The measure of a singer should consist of a relatively small number of representative measurements upon specific capacities and achievements. These measurements must be set in a full survey by systematic observation and other verified

information bearing upon the variation of the individual as a singer. The classification of the measurements must be based upon (1) the attributes of sound which constitute the objective aspects of music, and (2) upon fundamental and essential processes in the singer's appreciation and expression of music. From the point of view of the objective sound, we must take into account pitch (with its complexes of timbre and harmony), intensity, and duration. From the point of view of mental processes we may group the tests under the heads, sensory, motor, associational, and affective, each of these furnishing natural subdivisions.

The writer then presents an arrangement of these proposed measurements in a program, which is also recommended as the outline for a systematic description of the individual in his capacity as a singer. The sensory group of tests includes five tests under pitch, two under intensity, and one under time discrimination. The motor group includes seven tests under pitch, two under intensity, and four under time. The associational group includes two tests under imagery, three under memory, and four under ideation. The affective group contains three tests under musical appeal, and one each under reaction to musical effect and power of interpretation in singing.

Seashore describes these special tests, indicates their significance, and suggests approximate norms for those cases for which they are at present available. For the accumulation of many of these norms, and for the conduct of the tests, special and elaborate apparatus and methods are required. For several years the workers in Seashore's laboratory have busied themselves with the problems concerned in the measurement and accumulation of norms for pitch discrimination, vividness of tone imagery, span of tone memory, consonance and dissonance, rhythmic ac-

tion, intensity discrimination, voluntary control of the pitch of the voice, and the singing of intervals.

Reference to norms thus acquired shows, for example, that in the case of discrimination in voluntary control of the pitch of the voice

a record of .9 vd. means that this ability is within three per cent of the best record for individuals under similar conditions, and that those who have such control are thoroughly qualified to render a high class of music in this respect; while a record of 9 vd. falls within eight per cent of the poorest ability measured, and is characteristic of an individual who cannot sing; whereas 3 vd. represents the average ability of an untrained individual.

Again, in another connection, and with reference this time to the discrimination of tones when heard, the same investigator has suggested that one who can discriminate a difference, from a given standard pitch, of 3 vd. or less may become a musician; one whose threshold falls between 3 and 8 vd. "should have a plain musical education"; one whose discrimination is so poor that 9 to 17 vd. is the measure "should have a plain musical education only if special inclination for some kind of music is shown"; while a measure of 18 vd. or above indicates that the individual "should have nothing to do with music." These suggestions were proposed for individuals of equal age, advancement and general ability.

That is to say, there are but three persons in a hundred who, having just sung the tone which is produced by a tuning fork vibrating 256 times per second, can then voluntarily and accurately change the pitch of the voice to represent the tone of a fork vibrating 256.9 times per second, a change of .9 of a vibration. But fifty persons

of the hundred can produce voluntarily a change of three vibrations, and ninety-two of the hundred can produce the very large change of nine vibrations. Seashore, of course, points out that in addition to these various measurements, "there must be other measurements, statistical data, biographical information, and free observations concerning musical training, traits of temperament and attitude, spontaneous tendencies in the pursuit of music, general education and non-musical accomplishments, social circumstances and physique," and that all these in their unity must be considered in the light of expert knowledge and expert technical insight before they can be said to give an adequate estimate of the particular individual's various capacities and qualifications as a singer. Those interested in the use of psychological tests in connection with musical ability should familiarize themselves with the many original reports from Seashore's laboratory.¹ The methods there followed may well serve as models for future analyses of vocational demands and individual tests.

If the highly specialized work of singing calls for such complex analysis and for such varied measurements, technical skill, and arduous collection of norms and standards, one realizes the utter folly of such vocational counsel as that which vaguely recommends the candidate to "be a musician," "be a writer." Indeed, we may now begin to see that it is only when each particular aspect of each particular calling is thoroughly analyzed into its elementary requirements, when reliable tests for the detection

¹ Phonograph record forms and instructions for several of the Seashore tests of musical aptitude may be secured from the Columbia Graphophone Company. References to some of the detailed reports are given in the bibliography to this chapter.

and measurement of these abilities are available, and adequate norms and standards accumulated in each case, only then can the method of the vocational psychograph come to have practical application in vocational analysis and guidance.

How far, we may now ask, has such analysis been able, as a matter of fact, to proceed with the representative types of work?

QUESTIONNAIRE METHODS

There have been several ways of attempting such analyses. One of these methods is that used by the various vocational bureaus in endeavoring to learn what type of individual is most in demand in the different occupations. Futile as these endeavors have been, it is nevertheless well to have them before us for our future reference and guidance. In the main the questionnaire method has been used in this connection; employers have been asked to state, in much their own way, the necessary or desirable mental and moral qualifications of those who might expect to succeed in the various kinds of work.

These replies have been collated and attempts made to secure "clinical pictures" of the type of individuals. These methods result in such characterizations as the following. The words specifying the vocation itself are omitted, and the reader is invited to guess which of the large number of possible callings is being described.

The girl who enters ——— should be able to use good language, and should dress neatly and appropriately in order to impress people agreeably. She should be able to write a legible hand, make clear figures, and spell correctly; a practical knowledge of arithmetic, especially fractions, is very

important. Prime requisites for success are interest and enthusiasm and a knowledge of human nature. The born ——— takes a vital interest in her ———, in her ———, and in her ———. She studies her ———, learns something of their ———, knows what their good points are, and is able to ——— about them intelligently and truthfully. She is a good judge of people, and she has the sincerity and the tact which enable her to help a ——— so to ——— as to go away satisfied and come to her again. Such a ——— is alert, energetic, and gives strongly the impression that she is in her place to ——— and therefore never displays an indifferent manner toward anyone who may ask her service. Loyal to her work, she is always courteous, for loss of temper means loss of ——— ———.

Now, if one but insert suitable words where the omissions occur, the paragraph remains equally applicable and illuminating when applied to any of the following occupations, diverse as they seem to be: housekeeper, waitress, stenographer, milliner, teacher, mother, doctor, nurse, cashier, saleswoman, insurance agent, bookkeeper, clinical psychologist, private secretary. The following paragraph is equally illuminating:

If a girl wishes to succeed in ——— she must be possessed with intelligence [How much?], good judgment and common sense. She must have good eyesight, good hearing and a good memory. She must have good perception and be able to concentrate her attention completely on any matter in hand. In addition to these she must be neat in executing ——— work and accurate to the last degree. It is absolutely necessary that she have a good education.

It would require several trials to guess of what particular occupation this is a psychographic picture.

It is clear at once that this method yields little infor-

mation of the kind we are here considering, beyond the cataloging of the general sterling virtues of mankind. The peculiar and distinctive mental functions presumably involved in the various types of work are just the ones that no one not an expert in psychological analysis could be expected adequately to portray. The so-called special qualifications, such as honesty, patience, attention, neatness, perseverance, do not represent elementary psychological categories. Moreover, they are qualifications with which no legitimate sphere of human activity can afford to dispense. In the long run they are characteristics which correlate to a high degree or, indeed, perhaps help to make up and constitute what we call general intelligence. In no case is there any specification of the precise amount of these various traits that may be needed. Since the days of the faculty psychology we have ceased to think of attention, memory, will, etc., as homogeneous powers which play in a general sort of way on all sorts of material. We usually find that when an individual is inattentive to one set of facts this is largely due to his being attentively preoccupied with some other set. Still further, no tests have been proposed which satisfactorily measure such traits as honesty, perseverance, promptness. Nor is it certainly known to what degree such traits are fixed characteristics of individuals and to what degree they represent present habits and tendencies modifiable in many ways if the circumstances call for such change.

A PRIORI DESCRIPTIONS

Turning from the employer himself, and his offhand description of the ideal worker, we may inquire what happens when the professional psychologist undertakes

this *a priori* analysis! An example is to be found in Münsterberg's *Vocation and Learning*. It is there pointed out that every act and experience has its threefold aspect, the aspect of knowing, that of feeling, and that of doing. Corresponding to these three aspects, there are to be pointed out in the case of each occupation the required information, the necessary technical skill, and the special guiding personal interests and social satisfactions. In order to clarify our knowledge of the special needs of the various vocations, and presumably to aid in the guidance of individuals in their vocational choices, eleven different representative vocations are analyzed on this threefold basis. Two or three of the analyses may be given here as an indication of the results arrived at by this method at the hands of the avowed applied psychologist. The specification of the particular technical knowledge we need not include for our purpose, since this consists of information supplied through some form of education. The outline on the following page brings together the requisite abilities and the implied motives and interests, as stated for the occupations of domestic worker, architect, physician, and journalist.

It is obvious that such analysis is inadequate for our purpose. For the most part the various vocations are said to be actuated by much the same motives, the leading satisfactions being honor, truth, position, beauty, progress, fees or salary, and welfare. These enumerations, of course, help us in no way to distinguish between the particular satisfactions or interests involved in the different types of work. Quite the same thing is true of the abilities required. Most of them call for energy, industry, judgment, and ability to deal with people. The same might

REQUISITE ABILITIES AND IMPLIED MOTIVES AND INTERESTS
OF VARIOUS OCCUPATIONS

Occupation	Domestic Worker	Architect	Physician	Journalist
Abilities required	Joyful work Energy Patience Teaching Economy Physique Housekeeping Sewing Cooking Nursing House furnishing	Esthetic sense Imagination Industry Drawing Modeling Specification Employment of men Architecture Engineering Heating Ventilating Construction	Social dealing Energy Discretion Tact Judgment Dissection Microscopical observation Psychotherapy Clinical activity Surgical technique	Sociability Energy Memory Accuracy Judgment Observation Typewriting Quick expression Forceful style
Implied personal motives and social interests	Morality Beauty Position Support Home life Family welfare Comfort of community Family comfort	Honor Beauty Position Fees Comfort Progress Housing	Honor Truth Position Fees Influence Welfare of community Health Prevention of disease	Honor Truth Influence Salary Progress Politics Education Information Entertainment

be said of prize-fighting, plumbing, and peddling. And do not the journalist and the housekeeper require tact as well as the physician? Is it true that the architect alone, of the four examples here given, has use for imagination and an esthetic sense, that the domestic alone needs physical development and joyfulness? Accuracy is perhaps more necessary to success in architecture than to the pursuit of journalism, while judgment, discretion, and observation would seem to be of occasional value even to the housekeeper and the architect.

In short, this type of *a priori* analysis gives us no more assistance toward the basis of a vocational psychograph than did the catalogs of sterling virtues provided by the

employers for the various vocations in their replies to the questionnaires.

SCHNEIDER'S CLASSIFICATIONS

Various other types of general analysis have been proposed, as well as different criteria, on the basis of which the occupations might be thrown under some form of psychological classification. Thus it has been pointed out that the traditional distinctions, on the basis of materials handled or type of product produced, give little indication of the type of activity involved or of the characteristics necessary for success. As Schneider has remarked: "If a boy were successful in wood-shop work, he was told he would make a good carpenter; however, wood-turning in a shop and outdoor carpentry are dissimilar types, while wood-turning in a shop and metal-turning in a shop are similar types."

Schneider has considered the problems involved in adjusting human beings to congenial types of work, and prefers to classify both men and jobs on the basis of certain broad characteristics which refer more particularly to interests, habits, preferences, and similar temperamental factors than to the technical psychological mechanisms employed in the work. He writes: "Every individual has certain broad characteristics and every type of work requires certain broad characteristics. The problem, then, is to state the broad characteristics, to devise a rational method to discover these characteristics (or talents) in individuals, to classify the types of jobs by the talents they require and to guide the youth with certain talents into the type of job which requires those talents." This is a big problem, but one possible of measurable solution,

or, at worst, possible of a solution immeasurably superior to our present haphazard methods.

As an illustration of what Schneider means by "broad characteristics," take his distinction between the "settled" and the "roving" types.

There is a type of man who wants to get on the same car every morning, get off at the same corner, go to the same shop, ring up at the same clock, stow his lunch in the same locker, go to the same machine and do the same class of work, day after day. Another type of man would go crazy under this routine; he wants to move about, meet new people, see and do new things. The first is settled; the second is roving. The first might make a good man for a shop manufacturing a standard product; the second might make a good railroad man or a good outdoor carpenter.

Or, again, consider his distinction on the basis of "scope."

Then there are two types—one of which likes to fuss with an intricate bit of mechanism, while the other wants the task of big dimensions—the watchmaker, the engraver, the inlayer, the painter of miniatures, on the one hand; the bridge builder, the steel-mill worker, the train dispatcher, the circus man on the other. One has small scope, the other large scope.

Basing his analyses mainly on the enterprises of manufacture, construction, and transportation, and recognizing that other broad characteristics would probably be listed if different types of occupation were also considered, Schneider gives a list of sixteen classifications which may be applied either to the individual or to the type of work. These are as follows:

- (a) Physical strength; physical weakness
- (b) Mental; manual
- (c) Settled; roving
- (d) Indoor; outdoor
- (e) Directive; dependent
- (f) Original (creative); imitative
- (g) Small scope; large scope
- (h) Adaptable; self-centered
- (i) Deliberate; impulsive
- (j) Music sense
- (k) Color sense
- (l) Manual accuracy; manual inaccuracy
- (m) Mental accuracy (logic); mental inaccuracy
- (n) Concentration (mental focus); diffusion
- (o) Rapid mental coördination; slow mental coördination
- (p) Dynamic; static

It must be said that the characteristics of the various types of work here enumerated are pretty much the features which have in the past guided such individuals as really chose their vocation rather than found it waiting for them, made a random selection, or seized the first available opportunity. The paired adjectives probably afford truer descriptions of various types of work than they do of types of individuals. Most individuals of one's acquaintance one would have to group neither under the one nor the other extreme, but in an average group which would show each of the opposed tendencies under special circumstances or would show no particularly marked degree of either tendency. Observation of such individuals for long periods of time and under a variety of circumstances would be required before these classifications could be made out by a stranger or by a professional coun-

seller. Even then such a classification could hardly be said to be psychological in any technical sense of the word, and it is not very probable that psychological training would much facilitate or validate the classification. We have already discussed the degree to which the individual's own judgment of his characteristics may be relied on in such an analysis.

The reliable vocational psychograph must be a much more elaborate affair, involving detailed job analysis, detailed specification of the particular aptitudes and skills required by the work in question, utilizing also specially adapted tests with reliable standards for the evaluation and selection of individuals in terms of these specifications.

In view of these facts we may profitably consider some of the more technical features in recent developments of the psychographic technique. On the one hand these take the form of seeking for a quantitative picture or profile of the individual. On the other hand they take the form of technical "job analysis" and "trade specifications." They often involve statistical procedures of a complicated kind, but a detailed knowledge of these procedures is not required for an understanding of the general principles involved.

TECHNIQUE OF THE PROFILE

This method requires that, in a variety of tests or traits, measures be available which are susceptible of expression in some common fashion or in identical terms. Any of the standard "expression units" may be used, with the usual exception of Original Scores. Thus the measures of all traits may be expressed in Distribution Units, or

in Ranks or Percentile Units, or in Absolute Units, or in Developmental Units such as mental age, or skill level. Such measures may then, in fairly legitimate ways, be compared, combined, averaged, and otherwise treated in quantitative fashion. When such measures are available a simple scheme of graphic portrayal serves many useful purposes.

Vertical lines may be erected, for example, along a horizontal base line, at equal distances. Each such line or column may stand for one of the tests or traits. Along one of the verticals may be laid off a scale in terms of the units to be adopted. On each of the remaining verticals may then be indicated, by cross bar or other indication, the degree or amount of the particular trait, or the individual's standing in it. This array of points, sometimes connected by lines, gives a readily apprehended picture, not only of the individual's general level of performance, but also of his relative status in the various respects, and of the uniformity or balance of his equipment in the features measured.

A horizontal line drawn straight across the chart may indicate the average level of all the characteristics, a summary of the general status. Another such line, similarly drawn, may be used to indicate the expected or normal status. The proximity of these lines will thus indicate the individual's general approach to normal or expected status. Their relative position will indicate either retarded or backward condition, on the one hand, or precocity and superior status on the other. A third line may, for special purposes, be used to indicate the level of some critical deviation—a deviation, for example, of sufficient degree to indicate practical inadequacy, rejection, promo-

tion, institutional care, lack of testamentary capacity, and so on.

If the tests or traits are grouped in the chart, on the basis of their common resemblances or their relation to certain more general aspects of personality, subordinate lines may be drawn, indicating status in these special sections or divisions. In case it is possible to arrange the traits or tests in a hierarchy on one or other basis, the general direction or slope of the profile line also becomes significant.

The degree of scattering of the separate scores or measures about their average line also has special significance in such a psychograph. It indicates the symmetry of the individual's characteristics. The theoretical "average person" would be at the expected or normal line in all the features represented. Instability of organization, unevenness of development, or marked special aptitudes and disabilities will be indicated by appropriate deviations of actual from expected or average status. Marked irregularity or scattering of scores is, it seems, likely to be associated in many cases with temperamental peculiarities. It may also, in special cases, indicate disease or deterioration, or the influence of particular factors such as drugs or such as highly specialized practice.

TYPICAL PSYCHOGRAPHIC PROFILES

In the following charts are shown, by way of examples, the partial psychographs of three boys. All three boys have the same general or average competence. In terms of developmental age units, this is average fifteen-year-old capacity. Rated on the miscellaneous intelligence scales, all three will be found to have the same mental

age.² But the psychographs show the abilities of the three boys to be quite differently patterned. One of the profiles starts high and gradually falls. Another starts low and gradually rises. The third maintains a fairly uniform horizontal course.

The tests employed in these three cases are arranged in a rough order, beginning with those that involve mainly motor behavior and the handling of concrete objects, actually present, through an intermediate region, to tests involving little overt muscular dexterity, but calling essentially for the mental manipulation of symbols, relations, meanings, and abstract situations. It is clear that, so far at least as present status is concerned, these boys are very differently endowed. The one excels his own average in the more mechanical and manipulative skills; another excels his own average in more abstract and verbal operations; the third has no outstanding aptitudes nor disabilities, but is near his average in all the tests.

For purposes of immediate selection and placement, the facts up to this point are significant and applicable. From the point of view, however, of prediction and guidance or advice, certain further facts are of prime importance. Although these three boys have equal general competence at the date of examination, it is quite certain that this will not always be the case with them. Note that boy A is only 8 years old, whereas B is 15, or nearly twice as old as A, and C, being 18, is more than twice as old as A. Our general knowledge of mental development,

²Percentile or distribution units are in general preferable for psychographic purposes, since they are not so liable to misinterpretation. But since for some of the tests used on these boys, the only norms available are on a mental age basis, that method is here employed.

Mental Age	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Grip																			
Tapping																			
Coördination																			
Profile																			
Seguin Board																			
Stenquist																			
Cancellation																			
Substitution																			
Community of Ideas																			
Word Building																			
Completion																			
Vocabulary																			
Cube Imitation																			
Digit Span																			
Digits Reversed																			
Verbal Memory																			
Opposites																			
Calculation																			
Directions																			

FIG. 2. Boy A

Actual age, eight years; mental age, fifteen years.

Mental Age	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Grip																			
Tapping																			
Coördination																			
Profile																			
Seguin Board																			
Stenquist																			
Cancellation																			
Substitution																			
Community of Ideas																			
Word Building																			
Completion																			
Vocabulary																			
Cube Imitation																			
Digit Span																			
Digits Reversed																			
Verbal Memory																			
Opposites																			
Calculation																			
Directions																			

FIG. 3. Boy B

Actual age, fifteen years; mental age, fifteen years

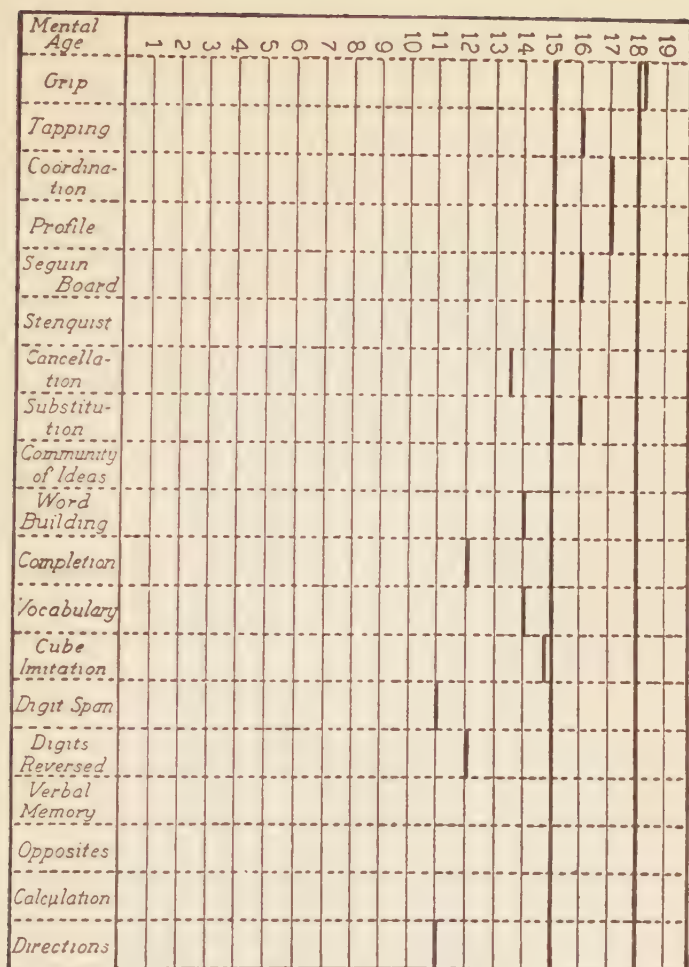


FIG. 4. Boy C

Actual age, eighteen years; mental age, fifteen years

verified by experimental data, justifies the conclusion that A is only about half way through his chronological period of growth; that B has just about completed his growth in native capacity, and that C has already ceased to develop in this respect. The profile of C therefore indicates his permanent level of achievement; B may change somewhat but only slightly; but A will surely grow very materially in all respects, and perhaps unequally in the various skills here represented. A, in other words, is precocious; B is quite an average boy; C is dull and backward. These facts are shown by the relative positions and distances of the lines of average competence and of expected achievement. These samples serve briefly to illustrate the very useful type of analysis that is facilitated by the psychographic method. The chart is of course not absolutely necessary, since the figures tell the same story; but the graph presents the facts with a concreteness and vividness that the figures lack to all except those adept in their use.

USES OF THE PROFILE METHOD

In recent years the profile or graphic method has often been adopted. Stern, many years ago, described the possibilities of some such technique. Rosselimo later used the graphic device, but for presenting data which were not expressed in adequately conceived units. Various professional "characterologists" have employed such charts for recording personal opinions and self-estimates in pseudo-exact terms. Allport has used a similar method for portraying personality profiles on the basis of questionnaire replies, with rough steps of classification. Downey, whose "Will Profile" method we have considered in

another chapter, uses the graphic device for portraying and analyzing the pattern of the various handwritings and other reactions. Seashore, who has established a series of quantitative measures for certain aptitudes involved in musical ability, uses the graphic profile to show the general level and symmetry of these measures in the case of individuals who have been examined. Educational psychologists, as Courtis for example, employ a somewhat similar device for representing the balance of a pupil's achievements in various school subjects. Kitson has used the psychograph as a concrete method of exhibiting the standing of college students in various skills and traits. Yerkes and Cobb, treating separately the various tests which comprise the Alpha intelligence scale used in the army, have shown that medical men in the military service show a characteristic profile in these tests. The method, in its various forms, has distinct advantages as an instrument of mental analysis in private consultation, clinical examination, psychopathological research, in the reëducation of inadequate personalities, and in experiments in vocational guidance and placement.

The profile in Figure 5 illustrates the psychographic presentation, by Seashore, of the array of musical talents possessed by an individual man. The vertical columns each represent some one trait, as measured or estimated. The numbers at the right indicate the percentile standing of the individual—his rank in a random group of a hundred persons of his age.

The full utility of the psychographic method will be accomplished only when technique and norms are available for the real measurement of a much larger array of characteristics. Such a personality picture has been for

many years the goal of individual psychology. Kraepelin, writing nearly forty years ago, expressed the need of such a method of portraying the "psychic status praesens." In psychopathological work, with which Kraepelin is chiefly identified, the need for more adequate exploration of the

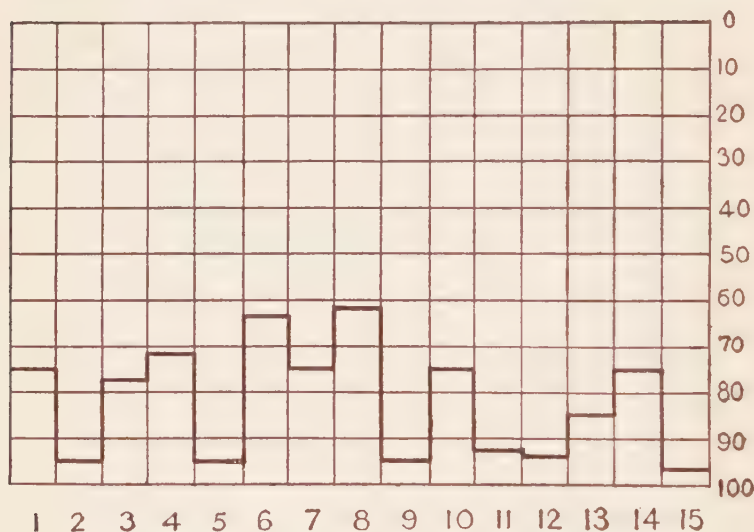


FIG. 5. A MUSICAL PROFILE

After Seashore

personality has always been real, and makeshifts have been frequently lamented. Kraepelin made many fertile suggestions toward the development of character measurements. Thus he commented on the Bertillon system of identifying an individual by his physical measurements and desired to develop a similar method of picturing an individual's mind. He insisted on the necessity of exact measurements, on the necessity of securing norms and

measures of deviation, and he attempted to indicate some of the important "personal dispositions" or aspects of the personality. In the work of Kraepelin and his students are to be found the beginnings of many of the practical applications of experimental technique, graphic record, and statistical procedure in character study. Even the scales for the measurement of educational accomplishment, so popular in recent years, are anticipated in Sommer's impressionistically arranged scales for determining ability in the fundamental processes of arithmetic.

JOB ANALYSIS AND OCCUPATIONAL DESCRIPTION

In recent years job analysis has had a remarkable development. The initial impetus was part of the "efficiency movement," with its emphasis on time and motion study. Here a close observation was made of the actual procedures of work, often with the aid of motion photography and other devices. Study of the operations, experimental variation of methods, resulted in improved modes of work, and often enabled the formulation of better standards and of improved ways of training the new worker.

The expansion of industry and the increasingly specific division of the operations of labor made the old terminology and classification of workers and trades obsolete. It was no longer meaningful, for example, to describe a job as "being a clerk," since there were now sales clerks, record clerks, filing clerks, transcribing clerks, service clerks, computing clerks, and so on, each with very different duties and qualifications. Some worked with figures, some with machines, some with other people. The situation was emphasized in the World War when the necessity arose of expeditiously assigning to respon-

sible and effective duty thousands of individuals, in situations where misfit employment and activity might have far-reaching consequences. A soldier was assigned to duty in the drug dispensary of a hospital. He had indicated "pharmacist" as his occupation because he had worked on a farm all his life. The absurd instance was by no means an isolated one. Such events speedily led to the development of a Personnel Division, in the difficult work of which impetus was given to the employment and classification procedures already in process of development in industry.

Job analysis now involves detailed and repeated observation of workers at their tasks, and interview with and skillful interrogation of workers and their supervisors. Specially trained trade interviewers are required, and much caution is needed in securing exact, complete, and balanced "work sheets"—descriptions of just what the particular worker does, and just what employer, supervisor, and operator contribute to the process. When sufficient descriptions of adequate numbers of cases have been collected, various interviewers in conference seek to draft brief but definite statements or "occupational descriptions." With these may go accounts of the requirements to be met by such workers, their education, age, special training, intelligence, character, physical traits, as definitely as rating scales, trade tests, profiles, and other methods permit. Detailed account may also be given of the conditions of work, prospects, pay, and like considerations. The endeavor is to render an exact and verifiable vocational psychograph, in which both the worker and the task are specifically characterized. The description is not on an *a priori* basis, but on the basis of empirical and

controlled observation and experiment. In actual practice, however, these "job specifications" are usually simpler and more "impressionistic" than the foregoing account would suggest.

SPECIFICATIONS FOR WORKERS IN SHOE FACTORY ³

1. **JOB:** Sole rounding machine operator.
Duties: Fits insole to wood model. Adjusts machine.
 Knives cut leather to form and size of model.
Intelligence and Schooling: Mental age of 13 to 15 years.
 Four years of education.
Training Required: One week to break in; one month to attain skill.
2. **JOB:** Bagger or top closer.
Duties: Operates sewing machine. Sews cot on lining and leather quarters together.
Intelligence and Schooling: Mental age of 12 to 14 years.
 Three years of education.
Training Required: Two days to break in; one month to attain skill.

TRADE DESCRIPTION FOR AUTOMOBILE MECHANIC ⁴

JOB: Automobile mechanic, for specified establishment.
Duties: Overhauls, repairs, and operates such standard machines as Dodge and Cadillac touring cars, and Mack, Standard B, and G. M. C. motor trucks. Tests, overhauls, and repairs motors, generators, and ignition units. Does acetylene welding, and uses such tools as lathe, reamer, and valve-reader.
Hours: 7:45 to 11:30 and 12:50 to 4:30 on Monday to Friday; On Saturday 7:45 to 11:45.
Working Conditions: Garage with concrete floor. Worker is on his feet about half the time. Much of his time he is

³ Adapted from H. E. Burt, *Employment Psychology* (Houghton Mifflin Co., Boston, 1926).

⁴ Adapted from Scott and Clothier, *Personnel Management* (A. W. Shaw Co., Chicago, 1923).

in a crouching or prone position, incident to repairs underneath cars. He is part of the time out of doors, especially when testing machines on the road.

Prospects: Principal lines of promotion are from truck driver, chauffeur, mechanic's helper, to garage superintendent and engine mechanic.

Qualifications:

Minimum: Must have graduated from common school and in addition have had three years practical experience in a garage or automotive shop as repairman. In lieu of one year of practical experience, six months special training in automobile repairing or one year as machinist apprentice will be accepted. Man 18 to 50 years of age.

Desirable: Should be physically strong, capable of occasional heavy lifting. Good eyesight, in order to do close work and make fine adjustments, although glasses are permitted. Keen hearing is also desired in order to enable him to test motors by sound. Accuracy is important, as errors may cause delay and impair work.

In some cases such job analyses are brief and the specifications succinct or general. In other cases they may require the combined effort of many investigators over many months of collection and analysis of data. The resulting trade specifications relate, however, to definite operations, rather than to "callings." They often relate to particular industries, locations, or establishments. They may enable one to know just what is expected of the applicant; what training he will require; what trade skill he must possess; what other qualifications he will need; how he may be able to work most effectively. If the requirements can be precisely stated in objective terms, applicants can be expeditiously examined, compared, selected,

and assigned to their most suitable posts with lessened waste and danger.

Although such job analysis includes much more than psychological investigation, the analyst can profitably employ such psychological aids, as of observation or of measurement and diagnosis, as are available. A full account of the topic would involve us in the complexities of technical employment procedures, which lie outside the scope of this book. The accompanying examples will illustrate the results of such analysis and specification in some of the very simple cases. References to more elaborate accounts are given in the bibliography for this chapter.

CHAPTER XVI

SPECIAL VOCATIONAL TESTS: I, MINIATURE AND ANALOGY

THE MINIATURE

The absence of complete vocational and personal psychographs has not retarded the search for tests which, though more or less fragmentary, may have vocational significance in guidance or selection. There are indeed many types of work for which tests have already been devised and tentatively tried out. Substitutes for the vocational psychograph, in the way of partial and suggestive tests, have been proposed in four principal forms. These may be designated the miniature, the analogy, the sample, and the method of empirical correlation. Since future work will probably continue to develop along these lines, the characteristics of these four methods may be indicated and typical illustrations cited in each case.

These four procedures are quite generally recognized to be but tentative expedients of an exploratory character. Individual workers have not always clearly recognized the principles involved in their procedure, but have proceeded as best they might under the special circumstances. Each method has its own advantages and defects.

First to be described is the method of the vocational miniature. Here the entire work, or some selected and important part of it, is reproduced on a small scale, through the use of a model, or a toy apparatus, or in

some such way attempting to duplicate the objective situation and appearance of things which the worker faces when engaged at his task.

Thus McComas, in testing telephone operators, constructed a miniature switchboard and put the operators through actual calls and responses, meanwhile measuring their speed and accuracy by means of chronometric attachments. Stern and others have advocated tests of the fidelity of report of a witness in court by letting him observe some rehearsed scene, some motion-picture representation of a series of events, or some pictorial portrayal of a scene or episode, and examining into the faithfulness with which he can describe what he saw there.

Patten, in testing engine-lathe aptitude, used a method not unfairly to be described as that of the miniature. The lathe operator must operate with precision the feed screws of the machine. The test consisted of the use of two similar screws, each connected with a writing point. The subject was required to turn the screws continuously so that the writing points followed paths arbitrarily indicated. Deviations from these set paths gave measures of the accuracy of the adjustment, which could be compared with other criteria.

The practical development of a "miniature set up," with elements of the "analogy" also involved, is illustrated in Wechsler's ¹ apparatus for testing motor car drivers. The operator is seated on a bench facing an exposure screen some ten feet ahead of him. In imitation of a motor car a footboard with clutch and foot-brake pedals, an accelerator button, and a steering wheel, hand-brake and other

¹ D. Wechsler, "Tests for Taxical Drivers," *Journal of Personnel Research*, 1926, Vol. V, pp. 24-30.

devices are provided. Lights appearing on the exposure screen serve as signals for specified reactions with hands or feet. Signals and reactions are automatically given and recorded, and measures of error, carelessness, promptness, and the like are thus secured.

These measures may be compared with the driving records of the chauffeurs. Thus from a quarter hour test of a group of taxicab drivers the following results are reported. Of those making no errors, 54 per cent had accidents and 55 per cent were rated high in carefulness by their supervisors. Of those making one to three errors, 81 per cent had accidents and only 31 per cent were rated high. Of those with four or more errors 88 per cent had accidents and none were well rated. There is thus at least a rough correspondence between test score and driving record.

Freyd proposed as tests for journalistic aptitude a series of performances, some of which have the character of the miniature. Thus in the account of a fire the subject checks the items of greatest importance. Errors in an exciting story are to be marked. The printed picture of a traffic accident is briefly presented, and after its removal the subject is requested to answer questions that indicate the accuracy and range of his observation of it.

On the whole the method of the miniature, although it has the advantages of concreteness and apparent relevance, has not been very productive, and there are but few instances of its use, in the strict form. In the cases cited, correlations of .40 to .50 have been found between the tests and various criteria of vocational skill. In certain other cases on record miniature street cars, tracks, miscellaneous vehicles, and the like have been represented

in a miniature fashion, for testing drivers. In still others, toy materials have been used for the construction of models of windmills, bridges, and such objects. But in these cases no statistical comparison with vocational criteria has been reported.

OBJECTIONS

The chief objection raised, aside from the difficulty of constructing serious miniatures of many kinds of work, is that such toy apparatus does not necessarily provoke the same subjective activities as the actual operations would, in spite of the objective similarity of materials. Thus ping-pong is a sort of miniature of tennis, but it is by no means obvious either that good ping-pong players will excel in tennis, or that the reverse will be the case.

Thus Münsterberg, in criticizing this method, insisted that

a reduced copy of an external apparatus may arouse ideas and feelings and volitions which have little in common with the processes of actual life. Experiments with small models of the actual industrial mechanism are hardly appropriate for investigations in the field of economic psychology. The essential point for the psychological experiment is not the external similarity of the apparatus, but exclusively the inner similarity of the mental attitude. The more the external mechanism with or on which the action is carried out becomes schematized, the more the action itself will appear in its true character.

Such *a priori* criticisms would of course be of no avail if the method did yield high and significant correlations with actual vocational criteria, but few of these have resulted from the use of the miniature procedure. In the light of these objections, some investigators have advocated

a method which they believe more accurately to reproduce what Burt calls "the total mental situation." This has usually taken the form of what we here call the method of analogy.

THE ANALOGY

By this method some test is devised which bears real or supposed resemblance to the sort of *situation* met by the worker in the given occupational activity. The material may be very different, but it is believed that the attitude and endeavor of the worker are the same. There is indeed usually a tacit or expressed belief that the same simple or complex mental processes or psychological functions are involved in the two cases, although the precise nature of the functions is seldom clearly stated. Sometimes these are vaguely named, by such terms, for example, as attention, quick decision, motor coördination, poise in emergency, reaction in fear, memory span, and so on.

Thus girls employed in sorting steel ball bearings, and also typesetters, have been selected on the basis of their speed of reaction to a sound stimulus. The assumption here is that "promptness and accuracy of response to a predetermined signal" is a common function or process which makes the various situations analogous. Similarly Münsterberg suggested that marine officers, who must quickly size up a situation and choose appropriate behavior in the face of it, may be selected by letting candidates sort into appropriate piles a deck of cards bearing different combinations of letters. "Quickness and correctness of decision" would, he maintained, be thus tested, but in an analogous situation.

The same investigator described a test for street car

motormen which, while being neither a miniature of their required work, nor yet a strict sample of it, was said to produce in them much the same "mental attitude." A brief account of this scheme will clearly illustrate the method of analogy.

The motorman faces the street traffic about him. Some moves parallel to his own course, some across his path. Different objects, as pedestrians, motor cars, and horse-drawn vehicles, go at different speeds. The motorman must in each case judge the nature of the moving objects, its distance, direction, and rate of motion, all in relation to his own progress and that of other traffic. Now how can we produce an analogous situation, involving similar attitudes of attention, judgment, and decision, without actually duplicating the complex scene in the large or in miniature? Münsterberg tried to do it in the following way.

A belt, moving before an exposure window, carried cards bearing numbers, variously colored. Numbers and colors indicated types of moving objects and different directions and speeds. Along the belt were drawn lines representing the track. On each side were other lines, representing zones or traffic areas. As each card appeared the subject had to decide where the traffic object represented would be, with respect to his own vehicle, at the next move; whether it would be on the track, past it, not yet up to it, and so on. Dangerous objects were thus to be discriminated from those whose movements and stations would not conflict with the car's movements. Several modifications of this analogy test for motormen and other drivers have since been devised.

Dodge's test for gunners followed the method of anal-

ogy. By means of a falling piston, moving in an oil chamber, a small target was moved across the field of view. On a moving lever was mounted a small telescope, the hair line of which could be lined up with the target as it moved. Record of the path of the target and that of the telescope afforded rough measures of accuracy. The device was installed on battleships for trial, and was reported to have considerable value as an aid in selection of gunners capable of accurate aim or quickly capable of training in this skill.

A German investigator proposes the following analogous machine for duplicating the general situation confronted by the aviator. Three large frames were constructed, each in turn rotating within another. In the innermost frame was a seat, which also rotated therein. The chair and frames could thus be tipped in various ways by appropriate levers, presumably producing experiences and inviting reactions similar or analogous to those involved in the use of an aeroplane.

Burr devised by this method a test for feather sorters in a factory, which gave a correlation of .65 with ratings by supervisors. Pieces of cardboard were prepared, analogous in shape and size to the feathers of an ostrich. The subject was required to estimate the dimensions of these cardboard objects. The errors of estimation could be recorded, and with the standard materials the test could be repeated on different occasions. Since the feathers had to be sorted according to size also, the assumption is that by testing "spatial estimation" the good workers may be distinguished from their inferiors.

In a recently reported series of tests for taxicab drivers the principle of analogy is much employed. The subject

has to trace with a pointer the most expeditious route of several irregular ones cut in a board maze, to show his tendency to take most direct routes, to slow down at corners, and the like. He is startled by unexpected electric shocks, sounds, and flashes in the dark room, after having been given instructions what to do if anything goes wrong. Thus his reaction time and good judgment in fear or excitement are presumably measured. In a somewhat similar way the behavior of men when startled, as by a sudden pistol shot, has been proposed as a test of their fitness as firemen and as aviators. In such cases careful records are often made of pulse, breathing, and steadiness.

Link² describes in the following words an employment test for hand-feed dial machine operators—a test which has some features of both miniature and analogy. It appears that although the methods may be distinguished, no very sharp line need be drawn between them.

On the top of a graphophone dial was placed a round sheet metal disk, large enough so that it projected considerably over the edge of the motor box. Near the edge of the disk were cut two slots eight inches long and an inch and a half wide. These slots were fitted with slides which made it possible to regulate the size of the opening. Under the disk and attached to the motor box in such position as to be directly under the revolving disk, was placed a funnel. At the neck of this funnel a Veeder counter was attached in such a way that a one-inch steel ball dropped through the funnel would cause it to register.

The object of the test was to revolve the sheet-metal disk so that the slots in its border passed over the mouth of the funnel at a certain number of revolutions per minute. As the slot passed over the funnel, the person tested was to drop

²H. C. Link, *Employment Psychology* (The Macmillan Company, New York, 1919).

the steel ball so that it would fall through the slot and into the funnel below it, where it would be registered. If the ball were dropped on the disk or at one side of the opening, it would naturally fail to register.

The situation is thus supposed to be analogous to that of the hand-feed dial machine, in which a series of holes in a rotating table must be kept filled with material to be stamped. The operator is required to fill these holes from a supply of materials near at hand. The test is reported to have shown a correlation of .50 with earnings of operators on a piecework basis.

In some cases a variety of analogy tests have been assembled, for a given kind of work, each presumably revealing the operation of some one or more of the "component activities" involved. It has even been maintained that by this means it is possible to "analyze the work" into its elements, correlating each of these with some vocational criterion.

A rough "capacity analysis" is thus attempted by the use of tests of the analogy type. Such procedure may be illustrated by the study by Muscio of "the psycho-physiological capacities required by the hand compositor."³ Observation of the printing compositor's work "suggested that certain capacities were required for it." In addition to (1) good eyesight and (2) better than average physical strength, the capacities enumerated and the tests chosen for their measurement were as follows:

3. "right hand and arm dexterity." "The subject was provided with a board containing rows of small holes into which he was required to insert matches with his right hand."

³ British Industrial Fatigue Research Board, Report 16, 1922.

4. "a capacity for rapid visual observation." For this the test consisted in cancelling specified letters or numbers from sheets of printed material.

5. "a relatively high degree of immediate memory," measured by a substitution test and a memory span test for printed passages.

6. "a relatively high degree of the capacity to estimate size and form." Thirty blocks were cut from a piece of board. "The subjects were given the board with the blocks distributed in front of it in standard positions and they were required to put the blocks into the holes from which they had been cut."

7. "at least a moderate degree of general intelligence." The test "consisted of a number of printed directions gradually increasing in difficulty, the task being to follow these directions precisely."

The feature of analogy is explicitly recognized. Thus the form board blocks were said to be "all more or less similar to actual quoins" such as printers use. The memory span test was described as "similar to an important part of the actual work of composition; it corresponds almost exactly to what the compositor calls 'taking a mouthful' of copy." However, Muscio was not content to rely on a *a priori* analogy. Experiments were made comparing the skill of compositors with their achievement in these tests, and correlations were established and utilized in the further evaluation of the tests, in the manner to be described in a later chapter as the "empirical method."

DIFFICULTIES

The method of analogy in its *a priori* form is full of all sorts of difficulties and sources of error, many of which, in the present state of our ignorance, are irremediable.

In selecting a new test which will involve the same mental attitude or call for the same psychological functions as are needed in the work itself, we are handicapped by the unreliability of the introspection of the examinee, and also by our inadequate ability to recognize, identify, and classify psychological functions.

Consider the assertion of motormen that the manipulation of a small crank in connection with a strip of checkered paper makes them feel quite as they do when guiding their cars through a crowded thoroughfare. This is far from a guarantee that "the mental function which they were going through had the greatest possible similarity with their experience on the front platform of the electric car." It is much more likely that the "mental attitude" referred to was merely the vague feeling that "Something is happening now," "This keeps me busy," or "What a nuisance this thing is."

Even if we knew the mental functions involved, as would be demanded by the method of the psychograph, we are still a long way from the time when we can exhibit a single psychological test and state just what functions its performance does or does not, may or may not, involve. Indeed, we do not even know what the various distinct mental functions are, or whether, as a matter of fact, there are such distinct functions. The method seems safe only when it ceases to be *a priori*, and relies not on discerned analogy but on demonstrated correlation of its results with some vocational criterion. But this is to use another method, to be later described.

On the whole the methods of the miniature and the analogy have not made very material contribution to either our knowledge or our practice. More profitable have been

the methods of the sample and the empirical correlation. The method of the sample somewhat resembles the miniature, but it chooses a small piece of the actual work rather than a small model of it. The empirical method is more like the analogy; it proceeds by finding other things in which the same people do poorly or well. But it displays less confidence in the preliminary analysis of just what functions are concerned, and it is less cocksure in its claims and predictions. These two methods are considered in detail in the next two chapters.

CHAPTER XVII

SPECIAL VOCATIONAL TESTS: II, SAMPLES AND TRADE TESTS

THE PROCEDURE OF SAMPLING

The method of the sample proceeds by requiring the candidate to meet definite specimen situations representing the tasks which his character and competence will be expected to handle in the actual job. In terms of his success with these samples his ability is rated as of such a sort as to fit him now to do the specified work with a given degree of success.

Thus commercial schools, in connection with the training and recommendation of clerks and assistants in business offices, commonly test their ability from time to time by assigning small pieces of work similar to that they will be called on to do in offices and shops. Finding addresses and numbers in a telephone directory, carrying out verbal instructions from memory, computation, typing, taking dictation, making out a trial balance, are common forms of this type of test.

In certain cases such work specimens have been devised in or conducted in the psychological laboratory, and the worker watched more closely and measured more exactly. This has been done, for example, in the case of clerical workers, salesmen, aviators, factory operatives, public speakers, handwriting experts, motormen, chauffeurs, typists, marksmen, musicians, and the like.

By this method no analysis of the work into its component traits is attempted, and ordinarily no distinction is made between native capacity and acquired skill. For the vocational test of this type to be significant, either the sort of work concerned in the occupation must be fairly uniform and homogeneous in its different parts and circumstances (as in the case of typists, accountants, filing clerks) or else there must be included a large number of samples representing all or many of the various unrelated sorts of operation. Moreover, in neither case is the test in any peculiar sense psychological. Such tests might indeed best be conducted by the employer. In fact, employment on trial, which is a common method of selecting employees, is a time-honored form of this test method, though a wasteful form.

However, although the method itself is not peculiarly psychological, it has appeared that the psychological attitude and familiarity with the statistical technique and the experimental procedures associated with psychology are necessary to put the method on a solid foundation. Some of the most definite advances in the measurement of skill and knowledge, notably the various educational scales and the trade tests, have been due in large measure to the substantial amount of energetic and critical work carried out by psychologists and personnel experts, adopting the method of the sample.

TRADE TEST METHODS

In the later development of the method of the sample, as in the trade tests and educational tests, progress came mainly through the development of technique for the selection, not so much of complete samples, as of significant

ones. Once the selection was accomplished the work of establishing the most probable skill level of the candidate as that of novice, apprentice, journeyman, expert, or as fourth grade, fifth grade, sixth grade ability, was fairly straightforward. The method of the sample, then, does not proceed by analysis of the particular trait-pattern of the candidate. Instead it measures his success in handling a significant task by whatever array of natural capacities, interests, education, and practice he may be able to bring to bear on the task. It represents, in a sense, a judgment of character, but of character in the lump, and in terms of present status only. It reveals neither the origin of the skill manifested, nor does it, taken alone, delineate the prospects of future achievement. Since detailed accounts of the derivation of such product scales and trade tests are available in the appropriate reports and manuals, we need give here but a brief sketch of them, as representing the modern development of the method of the sample. Further references are given in the bibliography to be found in the Appendix.

The trade tests afford good illustrations of this method. Here the samples chosen are either of actual trade skill or of trade information. Thus a truck driver is measured in trade skill by having him make a sample trip, accompanied by the judge. But the tests of different men, in different circumstances, and ratings by different judges, are given objective character and definition by their adhering to the general principles of a mental test. A standard outfit, standard trip, specified situations and emergencies, prescribed methods of scoring and of interpreting the score give results that have a validity far exceeding that of the mere subjective opinion of an inspector. The

“performance test” for general blacksmiths neatly illustrates the method of the sample, inasmuch as only one of hundreds of possible tasks is used. But the task is so chosen as to have demonstrated value in differentiating the various skill levels recognizable in the trade. It is thus a significant sample and serves as an index of the total equipment of information and skill possessed by the candidate. In this test standard equipment, materials, and tools are provided, standard instructions formulated, and a standard scoring plan prescribed. The candidate, presented with a blue-print specification for the making of a twisted hook of definite shape and size, carries out to the best of his ability the various processes of preparing, welding, twisting, punching, and bending the materials provided, so as to make a product conforming to the specifications. When such hooks are made under these conditions, are scored according to the prescribed criteria of excellence, and the standard scoring units are assigned, a score of less than two points characterizes the novice, whereas blacksmiths’ apprentices may score anywhere from 2 to 131 points. Journeyman blacksmiths are found to score from 132 to 143 points, inclusive, and only experts at the trade are likely to score above 143 points. This performance trade test thus not only illustrates the method of the sample but also the construction method of Response Values and the expression principle of Skill Levels or Developmental Units.

The performance test, as a method of sampling, approaches fairly closely to the traditional practice of hiring on trial. It differs from this method in its emphasis on standardization. In other forms of the trade test, the picture method and the oral method, a more indirect judg-

ment replaces the fairly direct perception of the candidate's skill. In these forms actual operative skill is not sampled. Instead, sample measurements of the information concerning the trade processes and implements or materials are used as indices both of the total stock of knowledge and of the most probable degree of skill thereby implied. Through careful preliminary investigation, standard oral questions and pictures calling for explanation, naming of parts, etc., are selected. These are so chosen that the score is not subject to the judgment of the examiner nor to chance replies, but can be objectively determined from the answers given by anyone who can read the scoring directions. They are chosen, moreover, so that the total scores from a given array of questions indicates, in the light of previously ascertained norms, the most probable skill level of the candidate. A series of ten to twenty questions, bearing solely on trade information which is elicited through oral interrogation or the use of pictures, can be selected so as to afford a significant and practicable index of actual occupational competence at the date of examination. This fact in itself shows the very valuable contribution to the analysis and measurement of human capacity made by the method of the sample.

The following series of questions was once used as an orad trade test for automobile mechanics. Each question, if perfectly correctly answered, is scored four points. On this basis, and applying certain other details of scoring that need not be rehearsed here, a novice makes below 13 points; an apprentice between 14 and 41 points; a journeyman from 41 to 57 points; and an expert scores 58 points or better.

AUTOMOBILE MECHANIC

1. What are steering column bushings made of?
2. What joint is there between the differential and the transmission?
3. What is the best way to repair a badly cracked cast iron transmission housing?
4. What damage would be caused if an engine became much overheated through lack of water?
5. What are the distributor brush holder covers made of?
6. What regulates the height of gasoline in a carburetor?
7. What happens to the breaker points if the condenser is bad?
8. What two metals are cam shaft bearings *usually* made of?
9. How are body springs fastened to the spring seats?
10. What part of the carburetor governs the speed of the motor?
11. What are two ways of driving the cam shaft?
12. What is the *most common* way to hold the wrist pin in position?
13. What is the result if the wrist pin set screw works loose?
14. What should be done in regard to the temperature of the motor before making any permanent adjustment on the carburetor?
15. What will happen if the timing gear teeth bottom or mesh too deeply?
16. What are the two windings in an armature or coil?

CONSTRUCTING A TRADE TEST

The most satisfactory scheme for the preparation of trade tests is rather elaborate. A large array of items must be used in the beginning. These may amount to almost a random sampling of items of trade information: questions concerning materials, tools, or processes; problems

dealing with pictures of such materials and implements; actual bits of work, using the representative trade materials and tools. In an oral trade test, for example, a hundred questions might be prepared, by questioning those familiar with the trade operations.

These questions, in a preliminary standardized form, calling for specific replies, are put to numbers of different individuals, whose trade status as novice, apprentice, journeyman, or expert is already known or judged by those acquainted with their skill and information. Replies are tabulated for the purpose of determining which of the hundred questions neatly differentiate these groups, or some of them. Thus a differentiating question might be one which is more and more often correctly answered by the progressively more skilled workers. Or a differentiating question might be one which would not distinguish novices from apprentices, nor journeymen from experts, but would sharply separate the two lower groups from the two higher, and so on. Many questions would be likely to be found not to have reliable differentiating value at all, or to have only a low value, as compared with other questions.

The most significant twenty questions might then be chosen. Standard methods of scoring the answers to these questions must then be formulated: some questions might be given more weight than others; degrees of adequacy might be recognized in the answers, and suitably scored. Then the derived list must be given in its standard form to large numbers of workers, whose trade status is known, to determine the typical scores of the various levels of trade information or skill. Only after these significant samples are thus selected and calibrated is it possible to

diagnose the probable trade status of a new candidate by their use. Much the same procedure is followed in the cases of written tests for group use, picture tests, and performance tests.

This method of the sample was found to be of great value in the assignment of recruits to somewhat general lines of duty in the army service. It also has considerable value in civilian industry, where general lines of duty are in question, as in the case of stenographers, telegraphers, accountants, shop mechanics, house painters, and the like. In large industries in which the division of labor is great and trade operations are highly specialized, general trade information and skill are less important. In such cases the method of the sample is still useful, but more often in the way of a try-out or demonstration than by way of a trade test.

Among the advantages of adequately constructed trade tests are the fact that they may be administered by one not himself proficient or learned in the trade, and the fact that the replies or products may be somewhat objectively scored. Such tests, for numerous trades, may thus be given in a central employment office. They thus serve directly to check up the claims of the candidate to trade status. They constitute an abbreviated, censored, and expedited form of "trial and error," with much of the error eliminated through the preliminary work of standardization. Their usefulness in vocational guidance is limited, since they depict only present skill or information, and do not directly reveal the capacity of the individual to learn to master the facts or techniques in question.

THE SAMPLE IN EDUCATIONAL MEASUREMENT

Such sample measures, when properly organized and applied, afford however something more than information to be used in the selection of workers for immediate assignment and occupation. They may be used also to measure the progress under training and the effectiveness of instruction, if adequate precautions are used. In the light of a candidate's previous experience they may also be used as signs of his probable future attainments. It was, as a matter of fact, to the confluence of two active enterprises—the measurement of educational products in school administration and the search for improved technique in trade interviews—that the striking advance of trade test methods, in the military emergency, is to be attributed.

In our earlier references to the measurements of the quality of handwriting, as an example of the use of Absolute Units, the use of the sampling method in educational practice is also illustrated. The educational product scales classify the candidate's present attainment in the subject to which they relate. Ability in penmanship, composition, drawing, history, arithmetic, algebra, Latin, grammar, reading, and various other academic skills, constituting as each does "a combination of a complex set of intellectual and muscular coördinations," are constituent elements of a candidate's total character. In practically all these instances of educational measurement the method of the sample is used as a basis for judgments of the more complex patterns of information and dexterity. Either sample tasks confront the pupil whose general rating depends on his success with these samples, or else a sample of his own work is rated on a concrete specimen scale.

The utility and validity of the method, whether in industry or in education, rests on the possibility of securing, in a limited set of test samples, reactions which, though far from exhausting the complex field of facts and actions, are nevertheless representative or significant of the whole structure.

It is quite beyond our present purpose in this discussion to enter into the details of the construction, use, and interpretation of trade tests or of educational product scales. Each of these is in itself an elaborate field, and they have been amply set forth in other places. Our purpose has been simply that of exemplifying, through them, the very striking advance in the diagnosis of human capacity in the case of one of the methods, that of the sample, which though early recognized and roughly employed, as in the traditional trade interview and the conventional academic examination, awaited the application of psychological and statistical technique and the coöperation of schools and industries with scientific men, before it developed into anything like a method of diagnosis.

CHAPTER XVIII

SPECIAL VOCATIONAL TESTS: III, THE EMPIRICAL CORRELATION

GENERAL FEATURES OF THE METHOD

In the early history of the methods of vocational psychology a method of analysis and appraisal was tried out which is especially characterized by the small number of assumptions which it involves. It is further characterized by the considerable amount of labor and of expert understanding for which it calls. This is the method of *empirical procedure* or the method of *correlation*. Beginning with a group of individuals who differ in known degrees with respect to some trait or capacity or skill, this method seeks for abbreviated and experimentally controlled clues to those differences.

A great number of measured details, such, for example, as physical features, individual interests, ability in numerous single tests, are compared with the known status of the individuals in the trait in question. Each measured feature is independently correlated with the known trade, professional or other status, in the hope that some may be found that are significantly and consistently related to the trait itself. The experimental tests need not of course be chosen blindly nor utterly at random. Analogies, samples, and attempted psychological analyses may be used as rough preliminary guides. But the inexperienced in-

investigator will be surprised at the number of his *a priori* "hunches" that turn out to be useless.

By such empirical procedure certain tests may be found which are positively correlated with the more general trait, capacity, or status, and hence may serve as symptoms or signs of it. It is not pretended that the significant tests are miniatures of the larger pattern, nor samples of its operation, nor even that they involve the same fundamental functions. The test record shows significant correlations with the ability or trait, so that excellence, mediocrity, or inferiority in the one is, as a mere matter of fact, empirically determined a symptom of standing in the other. This is not a unique logical procedure. In the same way a patient's temperature, or the activity of his reflexes, or the analysis of his blood or urine may serve as signs of the more general bodily condition.

Obviously several symptoms are more reliable than any single one of them, and in the correlation method several significant tests are sought for. These may be combined into a team or battery, or they may be used singly in a more analytic way. Preferably those tests are finally chosen all of which are closely correlated with the trait or ability, but none of which is closely correlated with the others.

In such a team or battery of tests each reveals, according to the magnitude of its correlation, a significant feature or part of the more general pattern, and no one test tends merely to duplicate the contribution of another. The greater the number of tests, the higher the correlation of each with the established criterion or trait or ability, and the lower the intercorrelations of the tests themselves, the more completely will the team reveal the total character pattern or status of the individual. By the proper sta-

tistical technique it is possible not only to correlate the tests with the trait and with one another, but also to determine the degree to which each reveals information not already contributed by the others. Various systems of weighting the tests may also be employed, so as to increase their predictive value, or so as to give each due influence when combined in the team or battery. We shall not attempt here to discuss these details of statistical treatment, but shall consider only the general methodological principles involved, and illustrate some of their applications in concrete cases.

SOME SIMPLE ILLUSTRATIONS

There are early cases in which tests having vocational significance were sought by purely haphazard and empirical ways. Thus Lough, having devised a form of substitution test (in which certain characters had always to be replaced by certain others, according to a prescribed key), proceeded to apply it to groups of commercial students. Speed of improvement was chosen as the thing of interest in respect to the test. Measures of this capacity, as shown by repeated trials with the same test day after day, were then compared with measures of ability in different types of work in which the students were engaged.

It was found that the test records agreed very closely with abilities in typewriting and fairly closely with abilities in business correspondence and stenography, whereas no definite relation was found between the test records and ability in learning the German language or in mathematics. The test is consequently recommended as a useful means of detecting typewriting and stenographic ability.

Another early illustration of the use of this method

is the study of Lahy, who put good, average, and poor typists through a number of tests of different sorts. He found that the only tests correlating closely with ability in the practical work were those for memory span, tactile and muscular sensibility, sustained attention, and equality of strength in the two hands.

Another early example of this purely empirical procedure is the investigation conducted for several years by Woolley in Cincinnati. Children who left the grades to enter directly into some industrial occupation were examined by a miscellaneous assortment of simple mental tests. These records were preserved, and the subsequent success or failure of the pupils in the various sorts of work undertaken by them in later life are to be as carefully recorded as is possible. It is hoped that when a sufficient amount of material of this nature has been accumulated the two sets of data may be compared and information thereby secured concerning the relation between ability in the tests and the types and degrees of industrial fitness.

In another investigation an attempt was made to discover, by this empirical method, a set of mental tests which would aid in the selection of efficient telephone operators. Thirty workers who were already employed under fairly comparable conditions were taken as subjects in a preliminary search for tests of value. They were put through a series of "association tests," of the familiar laboratory form—naming opposites, naming colors and forms, completing mutilated passages, following hard directions, giving responses bearing specified relations to stimulus words, cancellation and number checking, and the like.

While these tests were in progress, during a period of several days, the thirty workers were rated by three supervisors who were familiar with their work at the actual task, and who had for some time been observing their performance with a view to making subsequent judgments of relative ability. Each supervisor arranged the thirty workers in an order of merit, according to his or her impression of their relative efficiency. The judgments of these three supervisors were then averaged, and each operator assigned a final position on the basis of these averages. This was believed to be as accurate a measure of actual ability as could be secured under the complex conditions of the work.

The results of these ratings were then compared with the results of the various mental tests. Some of the tests were found not to correlate with the criterion (the ratings for actual efficiency as an operator). Three tests showed definite and positive correlations, as follows: color-naming, .37, hard directions, .40, completion, .33. When results from these three tests were combined, the records correlated with the ratings by a coefficient of .55. These three tests were therefore accepted as having some value in the selection of good operators, and search was continued, by the same method, for further tests which might also yield positive correlations.

Such a method is, to be sure, but a rough, provisional, and unanalyzed expedient. It calls for long and patient coöperative labor. It does not at once afford the systematic scientific insight which we may wish we possessed. But it will at least save us from the delusion that we already possess such insight, and it should serve to check the fervent and propagandist zeal that leads us to mistake

prophecy for service. Analysis and classification of the results which this method yields are possible when they are accumulated in adequate measure, and satisfactorily corrected and validated.

EMPIRICAL CORRELATION PROCEDURES

Certain prerequisites of this method must be enumerated. In the first place there must be an experimental group of individuals differing in known degrees or standing in known relations to each other, with respect to the trait or capacity concerned. If the trait is an acquired pattern, such as trade skill, the tests may then serve as signs of the presence of this skill, but they do not, on this basis alone, serve to predict the degree of ability to acquire such patterns. Ability to do the tests may have been acquired along with skill in the trade and hence may be part of or a result of that acquisition.

The use of this method for predictive purposes, as in vocational guidance, in the adoption of children, or in the selection of candidates for instruction or development, requires that the tests be made on unpracticed or naïve individuals, who shall then proceed through training and exercise to develop such degrees of the trait or skill pattern as they can. Comparison of original test scores, made before such practice, with skill ratings after practice will then yield correlations which, in varying degree, will indicate the prognostic value of the tests.

In both the diagnostic and the prognostic, that is the selective and the predictive, use of this procedure, correct trait or skill ratings on the experimental group must be available. To secure ratings which will be actually objective, or at least reliable, is by no means easy. It is

in fact one of the most formidable of the various problems encountered in the use of the method. Even when individuals have long records of achievement behind them, so that evaluation rests more directly on perception than on judgment, measurement of ability is far from simple. For one thing the circumstances and setting of the various achievements are usually neither alike, nor constant, nor obvious. Production records, sales sheets, and similar data, for example, do not entirely reflect the relative values of employees. They do not include the contribution made by each toward the "good will" of the public nor the prospect of continued or future returns.

Nor are such data in themselves necessarily comparable, since different workers may have encountered different geographical conditions, different competition, commodity differences, differences in consumer resistance. Salaries and wages are equally subject to irregular influences, such as length of service, for example. Task and bonus systems of rating inevitably involve a degree of arbitrariness or chance. Estimates of supervisors, as we have seen, vary from individual to individual and from trait to trait. Each factor which might contribute toward a correct statement based on criteria other than the tests themselves must itself be investigated, correlated with other criteria, and given its proportionate value in the trait or skill rating.

A TYPICAL INVESTIGATION

The following series of results, from Rogers' study of typewriting and stenographic ability, serves to illustrate at the same time both the prognostic and the diagnostic use of this correlation method. A group of students, upon

beginning their study of typewriting, were given various tests, chosen more or less at random. Each month thereafter ratings or measures of skill were obtained on the basis of set trials in the skill being acquired, with objective ratings for quantity and quality of work. On each monthly occasion these objective ratings were compared with the test standings, secured once for all at the beginning of the year. The table following gives the correlation of test scores and current skill for each of the first three months and for the last month of the year's work:

CORRELATION OF TESTS WITH SKILL IN TYPEWRITING (ROGERS)

Test	October	November	December	April
Verb-object .....	.41	.43	.46	.57
Color-naming .....	.30	.43	.45	.61
Checking numbers ...	.45	.47	.37	.30
Action-agent .....	.42	.43	.29	.40
Substitution .....	.21	.27	.11	.42
Agent-action .....	.29	.19	.40	.28
Direction .....	.11	.14	.19	.32
Opposites .....	.17	.11	.07	.54
Analogies	— .09	.21	.17	.00

It is clear, first, that these various tests correlated to different degrees with typewriting proficiency. They are arranged in the table in order of their significance throughout the year, as indices of this trait or capacity, from best to poorest. The correlation coefficients become smaller as one goes through the list of tests from verb-object to analogies.

If we suppose that achievement after one school year of practice indicates with approximate accuracy the prob-

able final standings in actual typewriting ability, it is clear that these significant tests are not only diagnostic at that time, but were also prognostic from the very beginning. Before the acquisition of trade skill was begun, these tests (the first four or five in the list as it stands) indicated with accuracy varying with their respective correlations, the capacity of the individuals to acquire the trade skill in question. The remaining tests were less indicative or not at all significant of this capacity to learn. Although the correlations increase somewhat from month to month in all cases, it is mainly the tests that indicate relative aptitude in the first month that also indicate it most definitely at the end of training.

Initial scores in some of these tests seem to show no dependable relation to typewriting proficiency. They would not be included in the final team to be used for such prognosis or diagnosis. So far as the table gives information, it may well be that several of the tests give equally good correlations merely because they sample or reflect practically the same elements in the total pattern. Or they may alike depend on some general type of competence. The best team will be made up of those tests from this list or from lists derived from further investigation, all of which give significant but usually imperfect indication of the total pattern, but which, by not correlating closely among themselves, suggest that they represent different features of that pattern. Under refined statistical treatment the precise amount of new information given by the addition of the results of any one test to those of another may be determined. Appropriate weight may be given to each test, in terms of its independent contribution, as mathematically computed. The accuracy of

the prediction based on the test scores may also be calculated. The reliability of the test scores themselves may be measured, as well as that of the various elements comprising the practical criterion.

The explanation of these statistical refinements is beyond the purpose of this book. They will be found described in detail in volumes on employment practice, personnel procedure, mental measurement, and statistical methods.¹ It should not require pointing out that even the results we have cited, until further verified, would apply only to typewriting ability under the circumstances described, and measured by the criterion actually used on this occasion.

DIFFERENTIAL TESTS

That some specific pattern of traits or aptitudes is involved in typewriting is indicated by comparison of the correlation of these tests in the two cases of typewriting and stenography or grammar. In the tabulation of Rogers' data on the next page the correlation of each test with typewriting at the mid-year period is compared with the correlations of each test with mid-year instructor's grades for stenography and for grammar, for the same group of students.

Here it appears that the same tests do not, in the main, correlate best with all three skill patterns. If we draw a line across the table separating the better from the poorer tests for typewriting, it is to be observed that although the good tests for this skill lie above the line, the

¹C. L. Hull, *Aptitude Testing* (World Book Co., Yonkers, N. Y., 1928), is particularly devoted to these techniques. An excellent guide to statistical procedures is H. E. Garrett, *Statistics in Psychology and Education* (Longmans, Green, New York, 1926).

tests that correlate well with the two other skills are found on the whole below the line. The typewriting correlations tend to decrease as one goes down the list of tests. Correlations with stenography and with grammar, on the other hand, tend to increase as one goes down the list of tests. It is just those tests that stand low as indices of typewriting skill that stand high as signs of stenographic and grammatical excellence. Certain tests, moreover, such as color-naming and verb-object, tend to correlate with all three skill patterns. These suggest the presence in all these skills of a common factor.

CORRELATION WITH MID-YEAR STATUS

Test	Typewriting	Stenography	Grammar
Verb-object . . . . .	.55	.36	.37
Color-naming . . . . .	.41	.34	.38
Checking numbers . . . . .	.53	.07	.22
Substitution . . . . .	.37	.40	.16
Agent-action .. . . .	.31	.19	.37
Directions . . . . .	.13	.46	.54
Opposites . . . . .	.15	.45	.40
Analogies . . . . .	.25	.31	.43

A further illustration of the possibility of finding tests with specific differential value is to be found in an investigation reported by Link.² Production records of inspectors and gagers in a factory were correlated with five different tests. These tests were card-sorting, tapping, cancellation, number group checking, and a directions test used as an index of general intelligence. The correlations were as follows:

²H. C. Link, *Employment Psychology* (The Macmillan Company, New York, 1919), p. 35.

DIFFERENTIAL CORRELATIONS (LINK)

	Sort- ing	Tap- ping	Cancel- lation	Check- ing	Intelli- gence
Inspectors .....	.55	.14	.63	.72	.14
Gagers .....	.05	.52	.17	— .10	.18

The single intelligence test does not correlate closely with production records in either operation. Of the remaining four tests, three correlate closely in the case of inspectors, the average of the three correlations being .63. But these three tests do not correlate with production in the case of the gagers, the average of the three correlations being .01. The other test, tapping, on the other hand, correlates fairly well in the case of gagers (.52), but poorly in the case of inspectors (.14). Here, in other words, is one test that correlates with neither type of work, several that correlate with one or the other but not with both, and none that correlates significantly with both operations.

A still more striking case of the differentiating of trade skills by tests is reported by Bregman.³ Sales girls and clerical workers were rated by supervisors so that they might be fairly classified as good, average, and poor, in both cases. In the case here considered the average workers are not considered, but test records of good and poor workers in each group are correlated with the ratings. The following table represents only a sample of the much more elaborate data presented in Bregman's paper, in which will be found also a description of the various tests employed.

³ Elsie Oschrein Bregman, "A Study in Industrial Psychology Tests for Special Abilities," *Journal of Applied Psychology*, June, 1921.

CORRELATIONS WITH RATINGS

Test	Good and Poor Sales Girls	Good and Poor Clerical Workers
1	— .16	.09
2	— .66	.00
3	— .79	.31
4	— .22	.28
5	— .79	.37
6	— .54	.28
Total 1-6	— .59	.34

The point of interest here is not so much the actual magnitude of the correlations as their contrasting direction. A set of tests which correlates positively with one operation correlates negatively with the other. The differential value of such tests, if it can be clearly and reliably established, is apparent. As Bregman remarks, "What is apparent is the tendency for sales clerks and clericals to pull in distinctly opposite directions, so that we have a difference between trades as distinct as the differences within a trade, if not more so."

IMPORTANT PRECAUTIONS

The examples given are typical of many now on record in the technical literature of mental measurement, and some of the later cases adopt more detailed statistical analysis, checks, and measures of validity. This is a method which, beyond all those we have considered, calls for statistical expertness, from the beginning of an empirical inquiry to the practical application of the results. We have unduly simplified the account of the method in this chapter, so far as statistical analysis is concerned, in the

interest of greater clearness with respect to the more strictly psychological features.

Thus, so long as correlations of skill pattern or vocational criterion with test scores are not perfect (and they never are), inference from test-rating to most probable skill or trait-rating, either prognostic or diagnostic, is not straightforward and simple. Since no perfect correlations have yet resulted from the use of this method, the inference from test score to valid judgment of vocational or trade status calls for statistical technique no less rigorous than that involved in the selection and validation of the significant tests. Application of "regression equations," the use of "scatter diagrams," and other devices make it possible to indicate, within specifiable limits of error, or with known probability of correctness, the trade skill likely to be associated with a given test score.

It should of course be borne in mind that two traits, or a given trait and occupational success, may not correlate throughout their whole range. Thus intelligence below a certain point may disqualify one for the work of errand boy. Intelligence above a certain point may act in the same way, because of dissatisfaction and brief job tenures. But within the middle range, intelligence may be fairly well correlated with success in such work.

A certain completeness of color vision is required to be a competent locomotive engineer, or taxicab driver, since colored light signals must be correctly identified. But beyond a certain point it is improbable that fineness of color discrimination is of any advantage in such work. Thus along a certain limited range of the degrees of a trait or of test scores, correlation may be close, although the total range may not disclose this fact, and single corre-

lation coefficients for the whole series may convey false impressions.⁴ For such reasons the correlation method may frequently be supplemented to advantage by other methods, such as those in which scatter diagrams showing the positions of all the candidates are prepared, or by those in which psychographic analysis of the individual is made, or by those in which critical scores are determined. A critical score is one which indicates the probable limit of trade usefulness. One scoring poorer than this will not be a promising candidate. This is a lower critical score. Of course there may also be upper critical scores, for people who do too well in the tests may represent levels of ability characteristic of those who will be bored with the job, or will quickly leave it for something better.

The following list cites some of the very many types of work in which this method of vocational and industrial analysis has been used. References to these and others will be found in the bibliography for this chapter.

Clerical workers	Telegraphers
Typists	Telephone operators
Comptometer operators	Motormen
Engineers	Aviators
Musicians	Stenographers
Printing trades	Factory operatives
Salesmanship	School teachers

We have already suggested, and can profitably emphasize again, that the use of tests and of correlation methods has distinct limitations, and in incompetent hands such methods may result in actual mischief. There are two ways, in practice, in which such dangers may best be

⁴E. L. Thorndike, "Fundamental Theorems in Judging Men," *Journal of Applied Psychology*, March, 1918.

avoided. If an industry or business or institution is sufficiently large to maintain its own personnel organization, a department of education, or a department of industrial relations, at least one responsible member of this staff should be an expert, trained in the methods of mental measurement, trade-test procedure, correlation technique, and general statistical procedure.⁵ Where such specialization is not feasible, part-time consulting connections may usually be made with psychological and statistical specialists connected with university faculties, with special bureaus of personnel and industrial research, or with the Psychological Corporation and its various local branches.

The empirical procedure is a method of analysis easily open to misuse. Misuse of the method, through failure to comprehend its inevitable complexity, may easily result in professional chagrin and practical disappointment. Altogether, the method itself is more important than any particular results that have been achieved through its application. It is the final method that must be applied to test the validity of any presumed criteria of character or of ability. Especially from the point of view of judgments in vocation and industry, the method has a twofold advantage. At the same time that it identifies the traits of the individual that signify successful work, it indicates, although it may not name, the aptitudes which the execution of that work involves. It is thus at the same time a method of character judgment and a technique of job analysis. The aptitudes themselves may best be referred to by using the names or descriptions of the particular tests,

⁵ H. E. Burtt, *Employment Psychology* (Houghton Mifflin Co., Boston, 1926), is a good reference book on such tests and methods as applied to the selection of personnel.

rather than by resorting to the free use of psychological categories.

It is essential that interest in the practical use of the psychological laboratory be sustained among those who are responsible for the further promotion of its methods and problems. But it is undesirable that public expectation be strenuously directed toward the laboratory until it has done more than outline a series of problems and initiate preliminary efforts toward their solution.

The specialized vocational methods—the miniature, the sample, the analogy, and the empirical procedure—constitute four definite and promising instruments of research. They have yielded results of demonstrable practical value in the selection of special types of workers and in the detection of particular aptitudes and abilities. The application of selected mental tests has already come to play an important rôle in the placement and training departments of a considerable number of industrial, commercial, and educational concerns. While the more slowly developing individual and vocational psychographic methods are being perfected, the specialized vocational tests may serve the purposes of temporary assistance and expedience. The results derived from their intelligent use and their further patient elaboration will contribute materially toward the establishment of more complete and systematic technique.

CHAPTER XIX

INTELLIGENCE AND VOCATIONAL APTITUDE

NATURE OF INTELLIGENCE

As we have already seen, there are numerous particular determinants of vocational fitness, many of which have psychological interest. Thus one might investigate the influence of physique, health, sex, age, and race on vocational aptitude and opportunity for employment. We have already had occasion to consider the importance of special talents, character traits, and general intellectual ability. The last of these, under the caption "intelligence," has been sufficiently studied so that a considerable amount of experimental data are at hand. We may illustrate, by a brief survey of some of the results of investigation in this field of general intellectual ability, the way in which the vocational influence of any of the above factors may be considered.

The trait that has the most general application in human life is the capacity to use symbols in a meaningful way, as signs of more remote or more elaborate situations and contexts. This capacity for symbolism is in fact the very essence of mental activity. It is this faculty of symbolization which, in one or another form, is measured by "general intelligence" or "mental alertness" scales. The most valuable data for our present inquiry into the relationship between intelligence and vocational aptitude come from

the use of such scales in connection with various criteria of occupational choice and success or failure.

INTELLIGENCE MINIMAL STANDARDS

For almost any specific activity a certain minimal intelligence level is necessary for adequate or satisfying accomplishment. Thus a mental age of three years or thereabouts is required for the acquisition of spoken language, and a mental age of seven or more is needed for the mastery of reading and writing. Observation of the occupational capacities of mental defectives has revealed interesting limitations of this general kind, some of which may be here cited.

Thus Vanuxem¹ found, through coöperation in the administration of the industrial work of an institution for the feeble-minded, that the following kinds of work required the mental ages given along with them. Or from the point of view of guidance, her finding was that individuals of given mental ages were able to do satisfactory work only at the tasks assigned in this list (adapted from Vanuxem) to their respective mental ages, or tasks below this level.

Burr,² on the basis of wide experience in a vocational adjustment bureau for girls, has suggested tentative lower critical scores in intelligence (mental age) for various forms of work in which the girls may be placed in local industrial enterprises. Thus a mental age as low as seven and one-half years was found to enable a girl to pack

¹ M. Vanuxem, *Education of Feeble-Minded Women*, Teachers College Contributions to Education, No. 174, 1925.

² E. T. Burr, "Minimum Intellectual Levels of Accomplishment in Industry," *Journal of Personnel Research*, 1924, Vol. III, pp. 207-212.

TASKS WITHIN THE CAPACITY OF THE FEEBLE-MINDED OF VARIOUS MENTAL AGES

(Adapted from Vanuxem)

*Adults of
the following
mental ages*

*Can be taught to accomplish the following useful
operations, under supervision*

- | | |
|--------------|---|
| 2 to 3 years | To carry pails of water and empty buckets; to carry soiled clothes to the laundry, but not to bring clean clothes therefrom; to collect trash, such as stones, leaves, twigs, from lawns and paths, and put in baskets or piles. |
| 4 or 5 years | To pull <i>one kind</i> of weed from garden; to minister to pigs, rabbits and chickens, but <i>not</i> to herd sheep or to milk cows. But can clean barns for the latter. |
| 6 or 7 years | To learn to garner <i>one kind</i> of fruit from garden or trees, not picking green or decayed, and omitting leaves, trash and grass, and not injuring fruit. To herd sheep, to milk cows, to do the <i>ordinary</i> processes of the laundry, using blueing and soap, and to do simple sewing. |
| 8 years | To do everything in the laundry, to set the table, to do most of the processes of cooking, but not general housework except under close supervision and direction. Have third school grade ability in reading and can profit from school through the third grade. |
| 10 years | This level is required before adults can do general housework, ordering and synchronizing the processes. They are capable of ministering to the simple domestic wants of human beings and of running a house, but are incapable of controlling or advising children except under simple conditions and in the things of which they are themselves capable. Have 4th or 5th grade ability in ordinary school subjects. Can read, write and do simple arithmetic; may be able to make representative drawings and to enjoy or use simple musical instruments. |

powder puffs. The following list summarizes the results given by Burr.

<i>Types of Work</i>	<i>Minimum Mental Age, Years</i>
Packing small articles not easily damaged by handling, such as powder puffs.....	7 to 8
Various pencil-making processes.....	8 to 9
Mounting buttons on cards, sewing bows on novelties, paper-box cutting and pasting, folding hair-nets, sewing hat linings, and steaming millinery materials.....	9 to 10
Stock keeping, checking, labelling, hand sewing, winding wool and cotton braid.....	10 to 11
Covering hat foundations, sewing in edging and facing of hats.....	11 to 12
High-speed label sewing, machine operating for millinery, shades, garters, powder puffs	12 to 13
Machine-sewing straight seams, threading and adjusting machines, assembling rather complex materials and parts, and completing garments	13 to 14

In these rather simple industrial operations the setting of minimal intelligence standards is not difficult, since a rather definite and objective criterion of adequacy can be secured. In more complicated work, as for example that of salesmanship, journalism, teaching, various degrees of success are permissible and useful and the establishment of an objective criterion is far from easy. In such cases efforts have been made to determine not the lower limits of intelligence, but rather the average and the range of intelligence of those who by continuing or being continued in given kinds of work, have appeared to be reasonably successful therein.

OCCUPATIONS MAY BE INTELLECTUALLY SCALED

On the basis of the average intelligence of workers engaged therein, a number of typical occupations have been shown to be capable of arrangement in a hierarchical fashion on the intelligence scale. Thus Burt³ reports the following intelligence scores as made, on the average, by groups of employees in different departments of a large tire making concern.

<i>Department</i>	<i>Score, Points</i>
Laboratory and drafting.....	147
Factory council	144
General clerical workers.....	138
Shipping department	112
Factory committee	108
Foremen	88
Finishers and builders	87
Inspectors	86
Handing out stock.....	76
Truckers and mixers.....	47

Even within a given "occupation" classifications based on or varying in average intelligence may be made. Thus Miner, comparing various salesmanship groups, found technical salesmen, insurance salesmen, wholesale salesmen, and counter salespeople to give average intelligence scores of 139, 112, 89, and 51 points respectively, on the scale used.

It is of course no news that some kinds of work require more intelligence than others. But until recently the details of these differences have been very uncertain. Even

³ H. E. Burt, *Employment Psychology* (Houghton Mifflin Co., Boston, 1926), p. 273.

with the extensive use of objective intelligence tests the facts are more complicated than some have supposed. We may give separately some of the results of the examination of large numbers of enlisted men in the United States army, classified by occupation, and certain other data from the examination of civilian groups.

INTELLIGENCE AND OCCUPATION OF RECRUITS

Much use has been made, in recent years, of the data from the examination of army recruits or enlisted men during the general draft made during the World War. Men were here classified according to professed occupation, and the average intelligence scores of these groups computed. These averages showed differences, although the range of scores within any occupation was great, and the overlapping of occupations in intelligence ratings was obvious. The following statement will serve as a brief summary of these results.

A rating of less than C on the test forms employed was characteristic of those who had been, through rough economic and social selection, occupied with raw materials, and with the care of animals and plants. They are illustrated by teamsters, miners, farmers, horse-shoers, concrete workmen, and the like. Such direct activities call for little symbolizing activity.

Men engaged with simple instruments, implements, and tools, calling for no occupation with symbols, but being at least a stage removed from dealing with raw materials, averaged C in the tests (telephone operators, automobile mechanics, painters, carpenters, bricklayers, machinists, telephone linemen, bakers, and the like).

In a higher group, averaging C plus, were those activi-

ties in which simple forms of symbolism were involved, but little management of symbolizing organisms (other people) was called for (filing clerks, bookkeepers, telegraphers, band musicians, shipping clerks, stock clerks).

When the occupation with symbols became more pronounced, and working with other people (symbolizing organisms) entered, as in stenography, dentistry, medicine, Y. M. C. A. work, drafting, and civil engineering, a rating of B was found to be the average.

In high grade professional activity and in work dealing largely with human management (army chaplains, engineering officers, professions) a rating averaging A in the tests was found.

For convenience of reference Fryer's ⁴ corrected adaptation of these original records is given on the following pages. There are listed 96 classifications. The table gives the letter rating, the average score in points on the army Alpha test, and the range of scores represented by about the middle 50 per cent of each classification.

It is to be noted that the highest and lowest scores are not given in this table, but only the range of the middle 50 per cent. Thus although the dentist group, for example, averages 110 points, one-fourth of the total number score lower than 80 points and one-fourth score better than 128 points. It has been suggested that the men in the highest and the lowest quartiles were probably not well adapted to the occupation they professed, being either distinctly superior or definitely inferior, in ability, to the general run of workers in that occupation. On the other hand it must be noted that almost any occupation provides place

⁴D. Fryer, "Occupational Intelligence Standards," *School and Society*, 1922, Vol. XVI, pp. 273ff.

INTELLIGENCE AND OCCUPATION

(Fryer's adaptation of the army data)

Occupation	Average Score	Range of Middle 50 per Cent	Letter Rating
Engineer (civil, mechanical)	161	110-183	A
Clergyman	152	124-185	
Accountant	137	103-155	
Physician	127	107-164	B
Teacher (public school)	122	97-148	
Chemist	119	94-139	
Draughtsman	114	84-139	
Y. M. C. A. secretary	111	99-163	
Dentist	110	80-128	
Minor executive	109	81-137	
Stenographer and typist	103	73-124	C plus
Bookkeeper	101	77-127	
Nurse	99	78-126	
Office clerk	96	74-121	
Railroad clerk	91	69-115	
Photographer	86	59-107	
Telegrapher, radio operator ..	85	57-110	
Railroad conductor	83	64-106	
Band musician	82	57-108	
Sign letterer	81	59-106	
Postal clerk	81	60-106	
Electrician	81	57-109	
Construction foreman	80	62-114	
Stock clerk	80	56-105	
Receiving and shipping clerk ..	78	54-102	
Druggist	78	61-106	
Factory foreman	77	59-107	
Graphotype operator	75	56-105	
Locomotive engineer	74	53-91	C
Farrier	72	54-99	
Telephone operator	70	46-95	
Stock checker	70	44-94	
Ship carpenter	69	49-93	

INTELLIGENCE AND OCCUPATION—(Continued)

Occupation	Average Score	Range of Middle 50 per Cent	Letter Rating
Handyman (general mechanic)	69	48-94	C cont.
Policeman and detective	69	46-90	
Auto assembler	68	51-97	
Marine engineman	68	47-89	
Riveter	68	42-86	
Toolmaker	67	50-92	
Auto engine mechanic.....	66	45-92	
Laundryman	66	45-91	
Gunsmith	66	49-86	
Plumber	66	44-88	
Pipefitter	66	44-88	
Lathe hand	65	44-91	
Auto mechanic (general) ...	65	43-91	
Chauffeur	65	43-91	
Tailor	65	42-89	
Bridge carpenter	65	44-88	
Lineman	64	43-88	
Machinist (general)	63	40-89	
Motor cyclist	63	46-88	
Railroad brakeman	63	41-86	
Vaudeville actor	62	31-94	
Butcher	61	40-85	
Locomotive fireman	61	44-84	
Blacksmith (general)	61	39-82	
Shop mechanic (railroad)...	60	38-94	
Printer	60	36-93	
General carpenter	60	40-84	
Baker	59	40-87	
Mine drill runner.....	59	39-83	
Painter	59	38-81	
Concrete worker	58	37-85	
Farmer	58	40-83	
Auto truck chauffeur.....	58	37-83	
Bricklayer	58	37-82	
Caterer	57	41-81	
Horse trainer	57	39-71	
Cobbler	56	38-76	
Stationary engineman	55	35-81	
Barber	55	34-78	

INTELLIGENCE AND OCCUPATION—(Continued)

Occupation	Average Score	Range of Middle 50 per Cent	Letter Rating
Horse hostler	55	35-77	C <i>cont.</i>
Salesclerk	52	38-96	
Horse shoer	52	33-74	
Factory storekeeper	51	31-79	
Aeroplane worker	51	26-77	
Boiler maker	51	31-74	
Rigger	50	33-75	
Teamster	50	30-72	
Miner (general)	49	40-71	
Station agent (general)....	48	21-89	
Hospital attendant	40	19-67	C minus
Mason	40	19-60	
Lumberman	35	18-62	
Shoemaker	35	19-57	
Sailor	32	16-59	
Structural steel worker....	31	20-62	
Canvas worker	31	19-60	
Leather worker	30	16-41	
Stationary fireman	27	19-63	
Cook	27	17-57	
Textile worker	26	18-60	
Sheet metal worker.....	22	16-46	
Construction laborer	21	13-47	
Fisherman	20	15-51	D

for a great range of ability in actual life. Law and medicine, for example, as well as plumbing and cooking, can make use of both dullards and people of genius. Rather dull ministers are probably better suited to dull congregations than brighter ones would be. The essential vocational requirement is that, within any field, the dullard undertake only the tasks that dullards can do acceptably.

From the point of view of employee selection, however,

it is useful to know the intelligence level of the group into which any new candidate is to be fitted. Since achievement anywhere depends partly on general ability, a knowledge of the intelligence ratings of established groups may be of considerable use in selection, placement, and management.

From the point of view of vocational guidance, such data do not afford clues for very specific recommendation. Individuals of C grade are found in over half of the 96 occupations listed in the foregoing table, and every occupation covers a wide range of grades. Furthermore it is far from certain that, because men of a certain rating are in a given occupation, this ought to be the case. Strong argument could be made in support of the claim that if our engineers were not so clever and if our cooks and hospital attendants were only brighter, this might be a happier world.

It is probably safe to advise an individual with a low intelligence rating against entering occupations where most of his coworkers and competitors will rate above him. Since man's reach so often far exceeds his grasp, and is encouraged to do so by most of the world's inspirational literature, the vocational adviser can here serve as a very useful moderator of ambition. Parents who steer their C-rating offspring toward the professions or urge them to undertake technical commercial training can also profit from a knowledge of the intelligence distribution within these groups.

It is not quite so clear what advice should be given the individual with a high intelligence rating. A few A intellects in our laundries, kitchens, police force, in our railroad stations, and on the vaudeville stage might simul-

taneously work out a great social benefit and a prosperous career. There is already on record what a bright mind did when it undertook to lay bricks. It is said to have revolutionized the bricklaying trade, and to have astonishingly reduced the number of movements required for a standard unit of work. It is pertinent, however, that this individual became known as an efficiency engineer, not as a bricklayer.

CHILDREN'S INTELLIGENCE AND PARENTAL OCCUPATION

Various data from civilian groups confirm the general intelligence hierarchy disclosed in the case of army recruits. Among the most interesting studies are several which approach the problem somewhat indirectly. They show the relation between the occupation of the parent and the tested intelligence of the offspring. Children may be tested at a very early age, before the effects of occupational activity and selection have influenced their mental content directly. If we suppose that intelligence ratings, secured early in life, indicate the innate and hereditary mental level of the individual, the ratings of children would afford a suggestive reflection of the general intellectual stock represented by their parents.

The report of Haggerty and Nash⁵ may be cited as typical. The survey considered, among other things, the intelligence and the paternal occupation in the case of over 6,000 school children in grades III to VIII in representative New York State communities not exceeding 4,500 in population. Each child is thus considered as coming

⁵ M. E. Haggerty and H. B. Nash, "Mental Capacity of Children and Paternal Occupation," *Journal of Educational Psychology*, December, 1924.

from this or that vocational group. We are not told, however, how many actual fathers or families are represented, so that the detailed comparisons are perhaps not very satisfactory. Greater confidence may be placed in the comparison of larger groupings.

Intelligence quotients, on the same scale, were secured for all the children, and the occupations of the fathers were recorded as reported by the teachers. Nearly half of the group were the children of farmers. The remainder represented 54 occupations. The median intelligence of children coming from these various occupational groups is given. While the data are inadequate to distinguish between specific vocations, the general hierarchy much resembles that of the army data. When the occupations of the fathers are classified in half a dozen groups, the two sets of data are quite alike.

There are then intelligence differences between occupational groups as now constituted. Further, similar differences are found among the children, however early they have been tested. From the point of view of statistical prediction this means that the background from which an individual springs is one of several indicators of the direction his endeavor should probably take for adequate adjustment. But such an indicator has little value in the guidance of individual cases. For vocations overlap in intelligence scores, even when their respective averages are different, and a wide range of ability can apparently find adjustment in any calling. So also the offspring of given parentage may vary considerably around their own average, and may deviate in either direction from the intellectual level of their parents. The adequate guides to the vocational direction of an individual are, not data concern-

ing parental intelligence or family occupation, but facts concerning the individual as a unique person.

MAXIMUM CRITICAL INTELLIGENCE LEVELS

Various studies of people engaged in simple occupations, as waitresses, policemen, factory operatives, and clerks, have shown that both the brighter and the duller workers show lower stability of job tenure than those in the middle range of intelligence. The dull presumably leave because of inability to meet the demands of the job. The brighter have been supposed either to find such work unsatisfying and to shift restlessly about, or else to find more promising work on a level more suited to their ability. For this reason some employment departments have set upper critical intelligence scores for jobs of this character.

The facts are equally important for vocational guidance. Individuals capable of better achievement should be led to realize that work whose initial novelty is satisfying may fail to hold permanent interest, after the novelty wears off. In many cases, however, it is a mistake to set upper limits to appointments to humble positions, from which individuals may be promoted to more responsible levels in the organization.

An important fact, often overlooked, is that promotion or advancement by no means always implies the continued use of the particular traits which distinguished the individual from his fellows on the lower levels of achievement. Thus the boy who enters business as a clerk may often move on through the work of sales management, buying, general publicity, and ultimate partnership. The capable mechanic or artisan may proceed from the work

of general helper to that of journeyman, expert workman, foreman, inspector, superintendent, contractor, commissioner of public works, or postmaster general. Marked boyhood propensities for wood carving indicate neither that a lad is capable of moving through these diverse steps of promotion, nor, on the other hand, that he must remain an apprentice or journeyman.

Progress, in many vocations, does not always imply, in fact almost never does imply, merely increasing the quantity or quality of the work at which one starts. Hence it may often be desirable even to encourage instability of tenure at simple tasks by allowing workers, capable of promotion, to begin there.

INTELLIGENCE AND SUCCESS WITHIN THE OCCUPATION

The facts are clear that within a given occupation success depends on many things other than intelligence. In some cases the data do show that intelligence plays an important rôle. Correlation between intelligence scores and various criteria of success have been found ranging from .50 to .90 in the case of office boys, clerical workers, clothing operatives, business executives. On the other hand, with certain types of sales work low and even negative correlations have been found, with particular groups. Burt remarks that "there is some indication that in the lower grades of selling, such as retail clerking, there is a slight negative correlation between intelligence and proficiency, while at the upper end, such as insurance and specialty selling, there is a slight positive correlation."

Cowdery⁶ made an interesting comparison of intelli-

⁶K. M. Cowdery, "Measures of General Intelligence as Indices of Success in Trade Learning," *Journal of Applied Psychology*, 1922, Vol. VI, pp. 311-330.

gence scores and proficiency ratings in the case of boys in an industrial school. In office, hospital, printing, and poultry work the correlations were positive. In gardening, laundry work, book binding, plumbing, and cobbling they were negative. In other sorts of work no considerable correspondence was found.

Bingham and Davis⁷ found a zero correlation between intelligence scores and business standing of 102 successful men. The explanation presumably is that the intelligence of all these men exceeded the lower critical score for such business success as theirs. Above this limit the differences in success depend on factors other than intelligence.

LIMITATIONS OF INTELLIGENCE TESTS

It seems clear that, however important intelligence may be as a factor in vocational accomplishment, other things also count, and sometimes heavily. What some of these other determinants are we have already suggested. Temperamental characteristics, active and sedentary dispositions, local or wandering inclinations, tendencies to competitiveness, imitation, suggestibility, sympathy, curiosity, and the entire series of instinctive propensities, dominant original or acquired types of satisfaction and annoyance, volitional, emotional, and habit differences, the moral and social traits, such as persistence, frankness, piety, loyalty, zeal, confidence, aggressiveness— all these may be expected to combine in varying relations of compensation and reinforcement, substitution and facilitation.

What one lacks in quickness it is often possible to make

⁷ Bingham and Davis, "Intelligence Test Scores and Business Success," *Journal of Applied Psychology*, 1924, Vol. VIII, pp. 1-22.

up in persistence; what another lacks in ambition and competitiveness he may supply in the form of loyalty and zeal. Relative intellectual inferiority is often and easily balanced by the display of social charm. Persistent, well-directed, and enthusiastic effort or even a good vocabulary may enable one to compete successfully with the exceptional genius who does not display these incentives or advantages.

In proposals to direct individuals into their proper life careers it is essential to make sufficient allowance for the overwhelming importance of incentive, motive, attitude, and purpose, and the large rôle they play in determining the possible achievements of a nervous system. It is well enough to test the memory span, attention type, and reaction time of an applicant for a job as motorman on a street car. It is also important to learn the strength of his instinctive competitive reactions, to measure the degree of his belief in hell or in socialism, or the firmness of his intention to effect the higher education of his children. By "important" is meant calculated to reveal his fitness for the work. It may be safer to trust life and limb to a motorman whose feeble memory span is reinforced by loyal devotion to the comfort of his grandmother than to a mnemonic prodigy whose chief actuating motive in life is to be a "good fellow."

These comments should not be construed as an underestimation of the usefulness of the intellectual test as a preliminary precaution in engaging employees or in detecting extreme departures from the average. The use of such tests in discovering departures and variants has been amply justified by experience with them. But we are primarily concerned here with the determination of individ-

ual differences and qualifications within the large middle range of the curve of distribution. Here, in the case of the average individual, we must either:

(a) Demonstrate that these important non-rational determinants of vocational aptitude and satisfaction correlate very, very closely with more strictly intellectual ability; or

(b) Postpone the entire work of vocational guidance in these cases, on the basis of psychological examination, until that distant day when these characteristics can be approached by means of scales and norms; or

(c) Otherwise guidance must rest, as it largely does now in democratic communities, on the broad knowledge of opportunity afforded by industrial and prevocational training, the encouragement of thorough and systematic self-scrutiny, and the method of repeated trials.

The first of these alternatives is not yet accomplished; the second will probably not occur in our immediate generation; the third we have had always with us.

CHAPTER XX

THE VOCATIONAL APTITUDES OF WOMEN¹

RECENT CHANGES

It was once customary in discussing vocational problems to assume that the vocational future of girls is determined in advance by the fact of sex. Not infrequently the lack of provision for domestic training in schools and colleges was lamented, and suggestions advanced for establishing the domestic arts and sciences on a firmer basis in the educational system. Some paragraphs might be devoted to a discussion of statistics showing that thousands of girls go from school into industry, and to some inquiry as to what training is best fitted to assist them in earning a living for the period intervening between graduation and matrimony. With this the discussion of vocational problems commonly ended, so far as girls are concerned. The remaining space was given over to more adequate consideration of the vocational aptitudes and guidance of boys.

But changing times bring new problems and policies, new social and economic viewpoints. One of the most striking of such changes in the past quarter century has concerned the economic and vocational status of women. Social historians have pointed out that the recent de-

¹A large part of this chapter appeared in the first edition of *Vocational Psychology* as a special chapter by Professor Leta S. Hollingworth, of Teachers College, Columbia University.

velopment of specialized occupational activity on the part of women is but a step in a process of social differentiation long under way. The course of vocational differentiation may be briefly sketched as follows.

DIFFERENTIATION OF LABOR

Initially, under most primitive social and economic conditions, labor seems to have been scarcely differentiated. Men, women, and children alike took such part as occasion offered in the simple activities of picking berries, gathering firewood, catching fish, shaping crude garments, shelters, and implements. But the fact that women were biologically charged with child-bearing and nursing, which work could not be done by others, seems to have led to an early differentiation between man's work and woman's work. Inevitably confined to narrow quarters during late pregnancy, childbirth, and the immediately succeeding days or weeks, women undertook the tasks which such "confinement" would permit. These were the innumerable and varied chores of household routine, infant care, agriculture, pottery, weaving, and the care of domestic animals. Released from these localized routines and not hampered by confinement the men engaged, in common, in such work as hunting, fighting, exploring, trapping, and barter with neighboring tribes. Their vocational activities, though similar, expanded into a wide geography and involved social contacts and coöperative enterprise. The first step was thus the differentiation of the work of men from that of women.

Next came the division of labor among men. Some specialized in hunting, others in making weapons; some in barter and trade, others in the cultivation of particular

hand crafts; some in magic and healing, others in fighting. The further this differentiation of the work of men was carried, the more dissimilar were the activities of individual males, and the more effective the work of production, trade, and management. By sticking to one kind of work each man became expert therein, and this resulted in greater and better production of goods. Men's work thus became heterogeneous and the training and vocational outlook of boys was varied, specialized, and complex.

Meanwhile woman's work remained homogeneous, that is, each and all did that general array of tasks called woman's work, housework, domestic work. The training and vocational prospects were similar in the case of all girls—they were prepared not for special trades but to be "wives and mothers." This situation seems indeed to have been reinforced in primitive life by the fact that the fighting power was in the hands of the males. An important part of their conquest of neighboring tribes consisted in stealing the girls and wives, who in turn became the personal property and slaves of the victors. They became as skilled as might be in housework, personal service, nursing, and later, as prosperity increased, in certain more or less decorative graces.

Naturally enough, there thus developed a set of "masculine traits" and "feminine traits." Men were rough, women gentle; men were competitive, women self-sacrificing; men were increasingly controlled by impersonal facts of cost and market value, women somewhat more by personal attachments and placations. These were masculine and feminine traits in the same sense that there were masculine and feminine garments. They were ac-

cidents of social development, not biological correlates of differences of sex.

DIFFERENTIATION AMONG WOMEN

More recently many things have conspired to introduce heterogeneity into the ranks of women. The facts are so familiar that they need not be recited here at length, but may be briefly indicated. The machine age took many processes out of the home into the factory, leaving the houseworker less to do, but requiring more money for the purchase of such factory products. The widespread development of methods of voluntarily limiting the number of offspring resulted in smaller families, thus relieving women of still more of their traditional work. This was further reduced by the social and educational developments which placed children for several hours each day in places other than the home.

The release of woman's energy from the full day of routine household and nursery tasks, her own education and broader social and intellectual outlook, the need of increasing the family revenues, and the fact that many women could do acceptably more complicated tasks than those primitively allotted to them, all worked together. Women began to enter every occupation, trade, and profession alike. Their interests and training became diversified. Married women in great numbers began to continue their vocational activities after marriage. Thus developed the final stage—the striking differentiation of labor among women and the specialization of woman's training and prospects.

SOME DISPUTED QUESTIONS

This movement is part of the general change in the political, economic, and social status of women, so characteristic of our generation in all parts of the world. During this readjustment there has been much dispute over a number of questions concerning women and their vocational aptitudes and hygiene. The debate is now less animated, as the questions are being answered by the march of history and the accumulation of scientific data on individual differences and mental hygiene. It is the purpose of the present chapter to survey some of these topics. They have apparently persisted, in part at least, because of a general failure to recognize the simple and inevitable course of the development of labor differentiation as just sketched. This failure of understanding has led to numerous myths, rationalizations, conjectures, and dogmas. These arose in part to explain current practices, in part to justify them, and in part to perpetuate them. Their growth and social spread was fostered also by the lack of scientific knowledge concerning the constitution of human nature, and the origin and development of its diversities and institutions.

INTELLIGENCE OF MEN AND WOMEN

Are there any innate and essential sex differences in tastes and abilities which would afford a scientific basis for the traditional assumption that the vocational future of all girls must naturally fall in the domestic sphere and consequently presents no problem, while the future of boys is problematical and may lie in any one of a score of different callings, according to personal fitness? Is the old expectation that all women will follow the same vocation,

housekeeping or homemaking, founded on any facts of original mental nature, or does it arise merely from traditional expediency connected with acts of child-bearing and care? Does it lead to a waste of energy and talent?

The discussion takes the form of five general questions, and the replies to be made to them in the light of our present knowledge on the basis of experimentally determined data. (1) Are there innate sex differences in average intelligence? (2) Is either sex more variable than the other in mental traits? (3) Are there any special causes of intellectual inefficiency affecting one sex but not the other? (4) Are there any sex differences in affective or instinctive equipment which would naturally lead to vocational differentiation of the sexes? (5) What explanation is to be given of the traditional division of labor between the sexes, and their different histories of achievement?

It is necessary at the outset to draw a clear distinction between the *literature of opinion* and the *literature of fact*. The literature of opinion includes all written statements, made by scientific men and others, not based on experimental evidence. The literature of opinion on the subject of sex differences is voluminous. It appears in the writings of Nietzsche, Schopenhauer, Mill, Möbius, and others. By the literature of fact is meant those written statements based on experimental data which have been obtained under carefully controlled conditions, and which may be verified by any one competent to understand and criticize them. We shall seek answers to the propounded questions in the literature of fact alone, neglecting as irrelevant to the discussion the entire literature of opinion.

Since the discussion is limited to the literature of fact it will of necessity refer only to literature of compara-

tively recent data. Until about twenty-five years ago there had been practically no attempt to collect precise data on the subject of sex differences in mental abilities. Before experimental data were sought the hypothesis was accepted that human females are, by original nature, different from and inferior to human males, intellectually. The factor of sex determined everything; the way to discover whether an individual was capable of any given intellectual task or responsibility was not to let the task be undertaken and judged by the result, but to indicate the sex of the person in question.

Coincident with the controversies of the nineteenth century over the higher education of women, statistical studies were carried on by the questionnaire method. These were followed by experimental studies, and at the opening of the twentieth century experiments were being made definitely to investigate the matter of sex differences in mental nature. Then also the idea gained headway that whatever differences exist between the sexes as we find them in the world may be due to training, not to original nature; may be social correlates, not biological necessities. It was realized that this aspect of the matter complicates even experimental investigation, in ways difficult to control.

We may speak first of experiments on brain weight, published and much discussed about forty years ago. Romanes, among others, insisted that the male brain was on the average several grams heavier than that of the female, and for the time it was supposed that the fact of innate female inferiority had been thus satisfactorily established. However it was later demonstrated that, relative to total body weight, the female brain is as heavy as that of the male.

It was furthermore found that no positive correlation can be established between brain weight and intellect, except in limited cases of pathological anomaly.

In various experimental studies² by the methods of mental measurement the result of tests in various mental traits was that the differences between the sexes were in no cases as great as the individual differences within either sex. Such differences as were found were not consistently reported, in the main. The larger the number of cases and the earlier in life the measurements were made, the less did valid differences appear. Men differed from each other (as did women also among themselves) as much as men differed from women. Two experimental groups of men differed as much as a group of men and a group of women. In only two familiar tests was a rather consistent difference found between the central tendencies of the sexes. In voluntary movement men excelled women; women were better than men in verbal processes. On the whole, however, the results indicate equality of mental ability between the sexes.³ It is enough for the present purpose to say that after about thirty years of collecting data by scientific experiment, the hypothesis that there is any innate sex difference in average intellectual ability has been abandoned by all psychologists who base their statements on scientific evidence. Thorndike⁴ writes as follows in summing up the experimental work on sex differences in average intellectual ability:

² See, for example, H. B. (Thompson) Woolley, *The Mental Traits of Sex* (University of Chicago Press, Chicago, 1906).

³ There are published from time to time in the *Psychological Bulletin* summaries of all important experimental work on sex differences in recent years. See, for example, the issue of October, 1914.

⁴ E. L. Thorndike, *Educational Psychology* (Teachers College, Columbia University, New York, 1914).

The most important characteristic of these differences is their small amount. The individual differences within either sex so enormously outweigh any difference between the sexes that for all practical purposes any such difference may be disregarded. . . . As is well known the experiments of the past generation in educating women have shown their equal competence in school work of elementary, secondary and collegiate grade. . . . The psychologist's measurements lead to the conclusion that this equality of achievement comes from an equality of natural gifts, *not* from an overstraining of the lesser talents of women.

Thus our first question—Are there innate sex differences in average intelligence, which would call for differentiation of vocations on the ground of sex?—may be answered. So far as the literature of fact tells us, we know of no established differences in average mental ability. The now considerable amount of scientific evidence shows that by the test of averages the sexes have equal ability to perform mental tasks.

VARIABILITY OF MEN AND WOMEN

The second question has not been so long nor so thoroughly investigated as has the first. Is there a sex difference in variability in mental traits which would call for a differentiation of vocation on the ground of sex? What we ask here is whether, when tested in any given mental trait, a group of boys will differ more from one another than will a group of girls (similarly selected and equal in number) differ from one another. In other words, are the members of one sex very much alike in tastes, interests, and abilities, while the members of the other sex differ over a wider range? Obviously this might be the

case, although the two groups yielded averages exactly alike. The answer to this question will be of decided significance for vocational psychology. For example, if it were shown by experimental data that human females are, by original nature, rather closely alike, whereas human males differ from one another by wide extremes, we should have scientific grounds for concluding that social justice and economy might well be served by the traditional policy of guiding all females into a single occupation, while males are encouraged to enter the greatest possible variety of callings.

The first discussion of the comparative variability of the sexes was broached about a century ago by an anatomist, Meckel. It is interesting, as well as amusing, in view of subsequent ideas about variability, to note what Meckel said. He thought the human female to be more variable than the human male, and he opined that, "since woman is the inferior animal and variability is a sign of inferiority" the conclusion was justified. Fifty years later, when Darwin put a different face upon variability, showing it to be an advantage and a characteristic affording the greatest hope for progress, the greater variability of the male began to be affirmed everywhere in the literature of opinion. Karl Pearson alone took issue with this view, which was current in the nineteenth century and is still widely credited, and pointed out that there existed as yet no literature of fact regarding comparative variability (though men of science had not on this account restrained themselves from uttering the most positive statements concerning it). Pearson thereupon gathered and computed hundreds of measurements of human beings, and presented his

results in a comprehensive article⁵ entitled "Variation in Man and Woman." He clearly demonstrated that there is, in fact, no indication of greater male variability, when actual anatomical measurements of adult human beings are treated with mathematical insight. Immediately Havelock Ellis, whose opinions were chiefly affected by Pearson's article, replied that when adults are made the subject of investigation, no information is gained regarding the matter of inherent or original differences in variability. Since birth, life and death, on account of social customs, etc., affect the sexes unequally, no one can say, in the case of adults, how much may be due to environment and how much to original nature. Had Ellis thought of this criticism before he wrote his own book, *Man and Woman*, the chapter on "The Variational Tendency of Men" would have required much modification. However his criticism of Pearson's material is no less just because he failed to apply it in his own case. It is true that measurements of adults do not tell us what might be the case with infants, who have not yet been subjected to the formative and selective influences of environment and training. Yet Pearson's article remained until 1914 practically the only literature of fact regarding the comparative anatomical variability of the sexes. There then appeared an article⁶ setting forth in full the measurements of two thousand new born infants, one thousand of each sex. The statistical result shows no difference whatever in variability between the sexes, although several different measures of variability were used.

⁵ K. Pearson, *The Chances of Death* (The Macmillan Co., New York, 1912).

⁶ H. Montague and L. S. Hollingworth, "The Comparative Variability of Infants at Birth," *American Journal of Sociology*, 1914.

It may seem irrelevant to dwell upon anatomical data, when the question relates to mental aptitudes. The pertinence of the data cited, however, lies in the fact that if any sex difference in physical variability could be established, this would suggest (though it would not prove) the existence of a sex difference in mental variability also.

Few experimental studies have ever been made for the express purpose of comparing the sexes in mental variability. Such data as we possess come incidentally, for the most part, from studies made with some other chief purpose in view. In 1914 there was published a summary of the data available up to that date.⁷ There was at the time very little evidence that could be cited but such as there was gave no ground for maintaining the existence of any sex difference in variability. Since 1914 boys and girls in great numbers and of various ages have been given a great variety of mental tests; language, arithmetic, and algebra tests on thousands of school children have been reported; college students and various groups of adults have been measured in intelligence and in various special capacities. In many of these the numbers of individuals have been sufficiently large so that study could be made of the distribution of ability within each sex. Many more physical measurements of the two groups have also been reported. The evidence from these extensive experiments is that there is no general sex difference in mental variability, in such characteristics as are now measurable. Evidence from the statistics of genius and the sex of inmates of institutions for mental defectives, often cited in this

⁷ This summary appeared in *American Journal of Sociology*, January, 1914. A subsequent summary is to be found in the *Journal of Educational Psychology*, 1928.

connection, have been clearly shown to rest on such influences as selection and social pressure and on differences in social standards.

It is true that there is as yet much controversy among those best equipped to understand the problems of variation, as to the proper methods of measuring comparative variability. The mathematical considerations involved need not be rehearsed here. But until it has been definitely determined just how comparative variability can be scientifically measured, it would seem premature to make any final statement as to sex differences in this respect.

We can therefore answer our second question thus: There is little or no agreement among those best qualified to speak, as to what constitutes the scientific method of measuring comparative variability. But according to the methods now deemed the most reliable, and according to those studies wherein presumably correct methods of measurement have been employed, there is no reason to suppose that there is any sex difference in variability, so far as the numerous traits tested are concerned. There has never been an experimental study made in which the sampling from both sexes was large, random, equal, and from groups of equal homogeneity socially and racially, that showed any reliable sex difference in variability. If we adhere to the literature of fact, we must conclude that, so far as we know, human females differ from one another as much as do human males in abilities and aptitudes.

SPECIAL CAUSES OF INEFFICIENCY

We now come to the inquiry as to whether there are any special causes of intellectual inefficiency which affect one sex but not the other. Under this topic we may con-

sider the periodic function of menstruation which characterizes girls and women. This has always been the object of superstition and taboo, and is such even among the civilized peoples of today. The literature of opinion is replete with references to it as a source of intellectual weakness and irresponsibility. We may let Frederick Harrison speak for a large group of writers on this point:

"Supposing all other forces equal, it is just the percentage of periodical unfitness which makes the whole difference between the working capacity of the sexes. It is owing to a very natural shrinking from hard facts, and a somewhat misplaced conventionality that this fundamental point has been kept out of sight."

The literature of opinion abounds in different notions, inconsistencies, and contradictory instances in the matter of the periodic function, and its alleged enormous influence on the intellectual and vocational life of women. Much of the opposition to the education of women was based on it, and it has even been exploited as a good reason why political freedom should be denied to women. It is positively stated that women are on this account unfitted to pursue professional and commercial life; yet it is not proposed that cooks, scrub women, mothers, nursemaids, housekeepers, or dancers should be periodically relieved from their labors and responsibilities.

There was until recently almost no literature of fact concerning the periodic function as related to the mental abilities of women. No effort had ever been made to subject this matter to study by instruments and methods of precision. Psychologists, while often stating the influence of periodicity on mental life to be fundamental and characteristic, entirely neglected to consider it when performing

experiments on women subjects. In 1909 Voitsecovsky performed an experiment on six women by means of instruments of precision. He thought he found a positive result and that there was shown to be an actual influence of periodicity on certain mental functions. His conclusions are, however, largely invalidated by the fact that all his subjects knew the purpose of the experiment, and by the fact that he neglected to use, as a control, human beings not subject to the phenomenon in question. He also neglected to present his data in full, so that the reliability of his conclusions might be calculated.

Two studies of this phenomenon appeared in 1914. The first was a study ⁸ of the effect of school work on menstruation. The investigator suspected, from his experience, as a physician and teacher, "that much of the incapacity claimed was fictitious." He determined, as an experiment, to institute a régime whereby no student under his supervision would be excused periodically from mental or physical duties, except in cases where some pathological condition existed. In summing up the data he says: "So far our results show all improvement (in the health of students)."

The second investigation ⁹ made a careful and prolonged experimental study of twenty-three women (using as a control the records of men subjects) and failed to demonstrate any influence of periodicity on those mental functions tested. These included speed and accuracy of perception, controlled association, steadiness, speed of voluntary movement, fatigability, and rate of learning.

⁸ A. E. Arnold, *American Physical Education Review*, 1914.

⁹ L. S. Hollingworth, *Functional Periodicity*, Teachers College Contributions, 1914.

Since then several studies of this kind have been reported in psychological and physiological journals, which confirm these general results. Some of these studies are listed in the bibliography at the end of this book.

We must answer our third question in this way: There is no great amount of experimental evidence on which to base a reply, but the data which we do possess show no influence, either detrimental or beneficial.

AFFECTIVE AND INSTINCTIVE TRAITS

The fourth inquiry is this: Are there any innate sex differences in affective or instinctive equipment that would naturally lead to a vocational differentiation of the sexes? Here we must acknowledge ourselves to be entirely without a literature of fact. The literature of opinion is extensive on the subject, and it would be interesting and no doubt instructive to collect and summarize the various and conflicting opinions of men as to the affective and instinctive differences between the sexes. Men and women as we see them in the world do differ in affective behavior, but no one can say whether these differences in behavior are original or acquired. There are different conventional standards of emotional behavior for men and for women, but no one would be justified in saying that such standards arose from inherent affective differences between the sexes. The very variety that characterizes the statements on this subject constitutes proof of the ignorance of mankind in regard to it.

Since exact data are lacking, the discussion of this last question need not detain us. We may, however, glance at one instinct which has repeatedly been stated to characterize women, and to constitute in itself a natural justifi-

cation for differentiating the sexes vocationally. This is the "maternal instinct." Since the period of helpless infancy is very prolonged in the human animal, and since the care of infants is an exacting and onerous labor, it would be natural for those who are not biologically attached to infants, to use all means at their disposal to fasten the whole burden of infant-tending upon those who are originally so attached. We should expect this to happen, and it does happen. There has been a continuous social effort to establish as a norm the woman whose vocational proclivities are completely and "naturally" satisfied by child-bearing and child-rearing.

In the absence of all data, it would seem most reasonable to suppose that if it were possible to obtain a quantitative measurement of "maternal instinct," we should find this trait natively distributed among women just as we have found all other traits distributed, which have yielded to quantitative measurement. It is most reasonable to assume that we should obtain a curve of distribution, varying from an extreme where individuals have a zero or negative interest in the care of infants, through a mode where there is a moderate amount of impulse to tend infants, to a second extreme where the only vocational interest lies in such activity.

The bearing and rearing of children is in many respects analogous to the work of soldiers. It is necessary to national existence; it means great sacrifice of personal advantage; and it involves suffering and danger, and, in a certain percentage of cases, the actual loss of life. Thus, as in the case of soldiers, every effort is and must be made to establish as a norm the extreme end of the distribution curve, where there is an all-consuming interest in patriot-

ism, in the one case, and in motherhood in the other. In the absence of all scientific data, we should, therefore, guard against accepting as an established fact about human nature a doctrine that we might expect to find in use as a means of social control. It is also fitting to raise the question as to just what is meant by the term, "maternal instinct." Does it mean desire for offspring which are as yet non-existent? Does it mean only the tendency to care for helpless offspring after they are actually in existence? Does it mean an interest in children as such, regardless of their origin? Does it consist in a mingling of all these elements? Does it involve, as an essential element, an interest in waiting personally upon infants? Is it at all a function of original nature, rather than an acquired pattern of habit? Is it, apart from experience, more characteristic of one sex than of the other? One certainly gains the impression from a perusal of the extensive literature of opinion that to most persons the term is quite unanalyzed, and that it calls for analysis. Recent attempts to show that maternal behavior is rooted in the effects of certain glandular products are far from convincing, and are in some cases unintelligible or even incoherent.

We have now considered four of our inquiries in the light of experimental evidence. A great amount of work remains to be done before we can answer most of them conclusively and to one question no answer at all can be given from the literature of fact. We can only say that, so far, scientific experiment has revealed no sex differences in the original nature of mind that would imply a necessary differentiation of vocations on the ground of sex. There exist no scientific data to show: (1) differences in average intelligence; (2) differences in mental

variability; (3) special causes of intellectual inefficiency affecting one sex but not the other; (4) differences in affective or instinctive equipment, implying a "natural" division of labor.

WOMAN'S BIOLOGICAL HANDICAP

The division of labor between the sexes, which has existed through historic times and still persists, originated, so far as we know, in physiological, not in psychological differences. The momentous physiological fact that women bear and nourish infants and men do not, is the great primary sex difference on which our economic and vocational organization has been built up. It might be supposed that natural selection would have evolved an intellectual (or unintellectual) type in women, which could find its complete natural satisfaction in the vocation of child-bearing and child-rearing. But such a selection could take place only if mental traits were sex-limited in inheritance, or existed as secondary sex characteristics. No mental trait has ever been proved to be sex-limited in inheritance, or to exist as a secondary sex character. So far as we know, daughters inherit mental traits from fathers as well as from mothers, and sons inherit them from mothers as well as from fathers. Under such circumstances the law of natural selection can never become operative to solve the vocational problems of women.

The fact that women have not in the past equaled men in "philosophy, science, art, invention and management" is frequently adduced as evidence of their innate unfitness for pursuits other than the domestic. From such evidence, however, we glean in reality no information whatever about the vocational aptitudes of women. We should

not expect any notable achievement in the past by women in the fields mentioned above, for the following reasons.

Women must bear and nourish infants, and men cannot. The period of gestation and the period of infancy are very protracted in the human species, together covering, for each infant reared, about six years. Until very recently no scientific methods of controlling procreation have been generally known or utilized. Thus women have borne great numbers of infants, all their youth and maturity being consumed by bearing and rearing young. The small minority of women whose lives happened not to be so consumed would be very unlikely to make any contributions in extra-domestic vocational achievement for two reasons. In the first place, all women were expected to mate and thus to procreate and rear offspring, and no provision was made by society for their training in lines other than those they would be expected to use. In the second place, those women who did not meet the common fate failed to do so for some special reason, such as ill health, mental disease, or the necessity of caring for decrepit relatives. The very causes of their celibacy would operate also against any vocational achievement on their part.

In the irrational trial and error method by which human institutions have been developed, the logical expectation would be that the great physiological sex difference in reproductive function would probably influence vocational activities just as it has done. We find in the traditional division of labor between the sexes exactly what we should expect to find, even though there were an identity of intellectual abilities and interests.

It seems both psychologically hygienic and socially desirable that the one incontestable conditioning factor in

the vocational differentiation of men and women be raised clearly to consciousness, rather than submerged, as in the past, by an elaborate system of defense mechanisms and traditional devices of social control.

CONTEMPORARY ADAPTATIONS

The foregoing questions, once eagerly debated, have now been given a status somewhat "academic" by the concrete march of social change. In the past quarter century women have been actively entering trade and industry in large numbers. In the same way they are now entering all of the professions. Not only do they work through the period between leaving school and matrimony. In rapidly increasing numbers married women are arranging to continue their vocational activities. The United States census showed, in 1920, that there were 124,000 married women in the professions, an increase of 40 per cent over the figures of 1910..

The questions here discussed are gradually being answered by the verdict of history, as well as by the testimony of laboratory experiment. The call on women in all branches of service during the World War and the new political responsibility, now being assumed by women in nearly all countries, have facilitated these changes from the old régime.

We are not concerned here with the extensive social and ethical features of this vocational differentiation of women. Recent developments are, however, quite in line with recommendations concerning mental hygiene in its vocational aspects. Many of the personal and familial adjustments which the vocational activity of women, in particular of married women, involve, are psychological

in nature. These adjustments are still largely individual and experimental, and no generalized solutions seem at present to be feasible.

Among these tentative adaptations may be mentioned the rapid development of nursery schools, part-time employment, changes in the traditional pattern of family life and the implications of marriage, voluntary limitation of the size of the family, economic and political independence of men and women, reduction in the hours of labor in almost every occupation, commercial institutionalization of cooking, serving, cleaning, laundering, changes in modes of apparel, rapid growth of apartment and hotel habits of life, differences in attitude between the sexes, and joint employment of husbands and their wives by industries and institutions.

The sex of the applicant is fast losing status as a determinant of vocational guidance and selection. Along with the horoscope, the type of facial feature, formal religious affiliation, and the occupation of the parent, it is rapidly being relegated to the literature of social anthropology. Here it will be tenderly classified as only one more example of the facile way in which humanity develops its superstitions and the reluctance with which it abandons them.

CHAPTER XXI

CONCLUSION

This survey of the field of vocational psychology and character analysis has brought to light numerous outstanding problems, exhibited their nature and ramifications, and indicated some of the contemporary endeavors toward their solution. In conclusion we may briefly review these leading topics, and suggest the present state of progress with respect to them.

There was first the general rôle of vocational activity in human life, and its great significance for the development and stability of the individual's personality and mental health. We saw clearly that although the economic, the humanitarian, and the esthetic features of work are important, its mental hygiene aspect also looms large. This calls for consideration of the characteristics of a suitable vocation, and it seemed possible to lay down general principles, as well as particular suggestions for individual cases.

Thus arises the next problem, that of how the individual can achieve the most nearly adequate knowledge of his or her own mental and instinctive constitution, equipment of capacities, tendencies, interests, and aptitudes, and a notion of the way one compares, in these respects, with his fellows. This led at once to a second question. How may the individual acquire information concerning the general or special traits required for successful participation in the

various vocations, in order to select a line of activity suitable to the constitutional endowment? Closely connected with this was a further question. How may the employer determine the relative desirability, fitness, and promise of those who may offer themselves as his associates and assistants, or for minor positions in his employ?

Obviously, if vocational psychology and character diagnosis were in their maturity, rather than in their late infancy, these various questions would resolve themselves into a single problem. The satisfactions of various types of work and the traits required for them would be fully known and specified, so that both the choice of the individual and the selection of the employer would proceed directly, once the individual's characteristics were also known, measured, and charted.

From this goal we are very far, but by no means hopelessly removed. As we have seen in the foregoing chapters, the line of attack is being advanced very unevenly at its various points. It is indeed characteristic of any new branch of science that it does not advance symmetrically and at a uniform rate, but moves ahead, now in this direction, now in that. The line of complete development is thus some distance behind the outposts of exploration. So also in the case of vocational psychology and character diagnosis, we may draw a rough line which shall represent the main region of advance, and we may also indicate the various points where the line lags behind or goes conspicuously forward.

Our survey of the antecedents of vocational psychology and of the pseudo-scientific pretensions showed that the main line of advance has left much behind it, in the way of ruins. It has abandoned the magical ritual of primitive

thought, the medieval search for significant omens and clairvoyant signs, the naïve faith in the revelations of structural characteristics, as elaborated in physiognomics and phrenology. It has taken its stand firmly at the point where emphasis is laid on the objective study of the individual's behavior.

Educationally this position shows itself in the abandonment of the purely disciplinary ideal of abstract training, and the substitution of practice in specific forms of conduct, exercise, and occupation, accompanied by concrete experiences with industrial opportunities, rewards, and satisfactions. From the more strictly psychological point of view it shows itself in the development of more systematic and reliably tested methods of delineating the make-up of individuals.

Interests, for example, are being analyzed, scrutinized, and evaluated, with a caution and a detail far beyond that of the earlier days of ready acceptance of opinion and personal impression. School achievement is rapidly being rated not in terms of a teacher's subjective impression of excellence and virtue, but instead by objective scales of skill and subject matter, and even by tentative scales of conduct, feeling and attitude.

In the measurement of the more strictly intellectual capacities, through the experimental application of mental tests, the line has shown a very decided advance since the beginning of the present century. Available intelligence scales make possible the diagnosis of intellectual normality, precocity, or defect, in units of considerable reliability. Not only in the case of pre-adolescents, where the development first occurred, but also in the case of ordinary and superior adults, quantitative measures of learning

ability and sagacity are now available. This step in itself is sufficient to put educational, industrial, and social enterprise in debt to the new science of experimental psychology.

But this by no means constitutes the only point of marked advance. More adequate methods, such as inventories, rating scales, and the like are also made available for the scaling of such qualities of men as cannot be exactly measured yet. Special tests for particular aptitudes, such as ability in music, drawing, writing, mechanical dexterity, social interpretation, have also been devised, which inject objectivity into fields hitherto most subjective of all.

Comparison of such measures with actual success in practical fields tends constantly to show high degrees of correlation and selective value. The fact that the correlations are not perfect raises numerous problems, the solution of which is now being attempted, with the aid of more elaborate statistical analysis and technical portrayal. The evidence now at hand suggests that the incomplete correlation comes, in part at least, from the fact that some of the tests of momentary achievement do not fully represent the ultimate capacities of the individual.

At this point the line is relatively slow in advancing. The obstacles encountered consist partly in our incomplete information concerning which of the tests at once reveal final capacity, and which do not. This information must necessarily come slowly because of the difficulties involved in securing the coöperation of subjects who will submit to the prolonged series of measurements which such investigations involve. In the meantime the trade tests have been developed which frankly reveal the momentary ability of

an individual, with little or no pretense of significance for his future achievement, either in the field tested or in other fields.

But another factor is in part responsible for the incompleteness of the correlations between test records and direct measures of occupational success. This is the fact that characteristics other than competence play a conspicuous part in daily life. The interests, the incentives, the emotions, the equipment of instinct and habit, which show themselves in such traits as curiosity, competition, loyalty, honesty, patience, promptness, playfulness, and the like, do not count for nothing. Moreover, it is likely that in addition to the common fund of "intelligence," each individual possesses in his or her own degree, certain more specialized capacities and aptitudes, for the complete measurement of which the scales now available are inadequate. But if there is yet little advance in the exact measurement of character traits, there is at least an agitated activity in that sector of the line, and in this line activity has usually been a sign of notable and speedy advance. The psychographic technique, the job analysis procedures, the character and temperament test situations, the interest analyses even in their present unfinished form, actually represent an enormous development since the early years of the century.

Another difficulty encountered is the fact that such direct measures of vocational success as have been utilized in the comparison with test and scale ratings are in themselves subject to a very large error. Only in recent years has it come to be the common practice to secure adequate records of the work of the individual, as contrasted with the work of the gang. Even today such records are avail-

able in accurate form for only the simpler operations, in which standardized conditions of work can be maintained. The relative success of salesmen, for example, is not fairly measured in terms of the amounts of their sales, the number of prospects interviewed, or the frequency with which the assigned tasks are accomplished, unless the local trade conditions of the respective territories are fully taken into account. Inasmuch as such errors of measurement tend to reduce the amount of apparent correlation between the traits measured, it is very probable that the psychological measurements are more significant than their present results may indicate.

From the point of view of the employer, the incompleteness of the correlation between tests and direct measures is of little concern. Even a very small positive correlation affords him a degree of guidance in the selection of his workers that was far from forthcoming under the haphazard methods of employment that have been traditional. But from the point of view of the individual who is seeking guidance, or who is accepted or rejected on the basis of his performance in psychological tests, any correlation which is imperfect may lead to occasional injustice and misdirection.

The diagnosis of the instinctive and attitudinal characteristics and the recognition of the more specialized aptitudes constitute two points at which the line of advance is relatively slow. It is at these points that the psychographic methods find their task. As we have already seen in detail, the methods of the individual and the vocational psychograph are still in the stage of empirical procedure. In this stage of their development nearly any effort to amplify or apply them is certain to contribute results

of positive value. The recent studies that have contributed most notably toward the further development of the psychographic technique have been in the form of the specialized vocational tests and methods. Such studies, in addition to yielding results of immediate applicability in the description and analysis of the special tasks at which they are directed, also constitute positive progress towards the more elaborate psychographic pictures of individuals and of tasks.

Meanwhile groups of further problems have been definitely organized, and preliminary steps taken toward their solution. The formulation of systematic guides to self-analysis and introspection and the study of the reliability to be placed in the individual's estimates of his own characteristics are making definite and interesting progress. The examination of the time-honored "recommendation" and the estimates of associates and friends, and the investigation of the accuracy of such judgments as are based on these testimonials, on the interview, on letters of application, on the school records, etc., have already thrown long-desired illumination on several aspects of vocational psychology and have suggested valuable improvements in technique. The effort to base the vocational endeavors of women on the data of exact inquiry, rather than on the maintenance of primitive taboos and domestic and literary traditions, has played its own valuable part in one of the most vital economic adjustments of our age.

The very fact that a systematic presentation of the problems and methods of vocational psychology is possible signifies an enormous advance beyond the very recent stage in which all vocations were mysteries, all choices a

serious form of gambling, and all employment confessedly a matter of impressionistic prejudice. To those who become familiar not only with the program of this new branch of applied science, but as well with the outstanding definite and positive contributions which that program has already yielded, the words of a constructive pioneer in this branch of scientific inquiry seem to be already a statement of fact, rather than the mere expression of a hope. "The nineteenth century witnessed an extraordinary increase in our knowledge of the material world, and in our power to make it subservient to our ends; the twentieth century will probably witness a corresponding increase in our knowledge of human nature, and in our power to use it for our welfare."

APPENDIX A

LABORATORY EXERCISES

Experiments and laboratory exercises are here given which will illustrate and clarify the topics and methods discussed in the foregoing chapters. The author finds it instructive and convenient to use these exercises or adaptations of them, in college and university courses in Mental Measurement, or in Vocational and Industrial Psychology, or in Applied Psychology. For such courses the present book serves as a convenient elementary text, and may be supplemented to any desirable degree by more detailed lectures and demonstrations, and by readings or reports of books and articles suggested in the Bibliography.

EXERCISE I

LETTERS OF APPLICATION

A series of letters of applications for some position may readily be secured, in various ways. Thus a business man who has advertised for an assistant, a newspaper that has run classified want advertisements, a family that has advertised for a housekeeper or a servant, a school or college that has received applications for admission, may be willing to provide such a series for scientific use. All such material should of course be kept strictly confidential, and used only for experimental purposes, unless the writers' consent to the use of their letters is secured.

With the letters of application available, choose a representative set of fifteen letters. Keep each letter separate and intact, enclosed in its envelope, with the stationery and original penmanship carefully preserved. Place on each a key letter, as A, B, C, D, etc., which will identify the letters and envelopes.

Considering the position for which the writers have applied, select four important traits which should be possessed by satisfactory applicants for this position. They may, for example, be such traits as honesty, intelligence, penmanship, tact, leadership, ambition, neatness, etc.

Ask ten different individuals to arrange the set of fifteen letters in an order of merit for one or more of these traits, placing in first place the best, in second place the next best, etc.

After two weeks or so have elapsed, ask the same individuals again to arrange these letters for the same trait or traits.

Now prepare a table of results showing the amount of

agreement between different judges in their first arrangement. Find the average position assigned each letter, and the deviations of the ten judges from this average. This will show, when these deviations are averaged, how much the judges tend to disagree on each letter. Averaging all of the average deviations will show how much the judges tend to disagree on the trait in question.

Do the judges agree more closely on some letters than on others? What are the characteristics of such letters? Do the judges agree on some traits more closely than on others? What are these traits?

Compare, in the case of each judge, his arrangements of the letters for a given trait on two occasions. In what simple way can you get a measure of his consistency, in each case? Are some judges more consistent than others? Are judges in general more consistent on some traits than on others? What explanations have you to offer for the results? How do your results compare with the conclusions presented in the text?

EXERCISE II

HUMAN CHARACTER IN PHOTOGRAPHS

Photographs of eight children are here provided.¹ Each photograph is indicated by a letter. Arrange the letters in a column alphabetically, so that after each letter may be placed numbers indicating the position assigned the corresponding photograph by each of several judges.

Select certain interesting character traits for judgment, such, for example, as humor, honesty, aggressiveness, intelligence, etc. If humor, for example, is selected, ask various persons to indicate the order of merit of the individuals

¹ The author and publishers are indebted to Dr. Florence Mateer, director of the Merryheart Schools, Columbus, Ohio, for her kindness in providing these photographs and authorizing their use in this book.

whose photographs are shown, ranking them from 1 to 8, number 1 being the highest in the trait, number 2 the next, and so on. In this way judgments may be made for several traits.

When several judges have made their rankings, make a tabular report of the results, showing the position or rank assigned to each photograph by each judge. It will now be possible, by various arithmetical or statistical procedures, to find the amount of agreement among the judges on each of the various traits. Do they disagree more in estimating some traits than in estimating others? On which traits is the agreement greatest? Does the amount of agreement have any necessary relation to the correctness of the judgments? Are some of the judges more representative than others, that is, do their judgments agree more closely with the average or combined rankings by all the judges?

By finding the average position assigned to each photograph it will be possible to learn which faces are judged to indicate the highest degree of the various traits, and which are judged to indicate lower degrees. Is it possible to point out any characteristics that lead judges on the whole to characterize a face as possessing or lacking a given characteristic? If so, what explanation of such tendencies are you inclined to suggest? Do these tendencies have any bearing on the actual significance of such signs?

In the case of intelligence it is possible to compare the verdicts of the judges, either separately or in combination, with the actual facts. All the individuals whose photographs are here given have been given intelligence tests, and it is possible to assign to each the actual mental age and also the intelligence quotient (mental age divided by chronological age, in all these cases, since all are less than sixteen years of age). Compare the individual judgments of intelligence, and also the combined judgments, with the mental ages of the children. What resemblance is found between judgments and this measure of intelligence? Having computed the intelligence quotient of each child, compare the

judgments, individual and combined, with these measures. What resemblance is found?

How reliably or accurately is intelligence, in this instance, estimated from the photographs? Does combination of the verdicts of several judges lead to higher validity than that characterizing the judgments passed by individual judges? How do the results compare with those given in the text?

DATA FOR EXPERIMENT WITH PHOTOGRAPHS

Photograph	Chronological Age		Mental Age (Stanford Binet)		Intelligence Quotient
	Years	Months	Years	Months	
A	9	11	11	11	131
B	12	1	8	6	70
C	9	2	12	11	141
D	8	8	7	6	86
E	7	7	11	5	151
F	9	10	5	6	56
G	8	8	10	1	116
H	9	4	9	11	106

EXERCISE III

JUDGING ONE'S OWN CHARACTERISTICS

This experiment requires the frank and conscientious co-operation of all the members of the class or group. There should be at least ten individuals, and fifteen makes a still better number. Of course the larger the group the more reliable the results, but the more laborious the mathematical work involved. Such an experiment honestly conducted with results kept confidential so far as individual cases are concerned, can be made to throw interesting light on individual character.

Select a few interesting trait-terms, such as intelligence, aggressiveness, poise or balance, humor, coöperativeness, energy, etc. Agree upon a concise definition of each trait-term,

and discuss these definitions, with illustrations, so that all the individuals have as nearly as possible the same working conception of what the trait-term is to denote.

Assign to each individual a letter designation, as A, B, and so on. Each individual prepares his own report sheet, but hands it in, marked not with his own letter but with some secret key, known only to himself. This is for identification and return of the report sheets at a later point.

Each individual then ranks in order of merit, for each of the traits chosen, all members of the group, including himself. Place the whole array of individuals in a complete order, assigning no two persons to the same rank. Call the best in the trait number 1, the next best number 2, etc. The report sheets may now be collected and a table of results prepared, showing for each individual the ranks assigned him by all the members of the group. The median or average rank given to each individual, or the total of all the ranks assigned him, now makes it possible to arrange all the members of the group, for each trait, in a final order, based on the combined verdicts of all the judges.

Each individual now recovers his report sheets. In the final order he has been given a rank for each trait, and this rank indicates the position in which he stands, according to the combined judgments of his associates. Considering each trait, the individual may now discover how far his own estimate of himself departs from the position assigned him in the final order. How accurately does he judge himself in each trait? Is he more nearly correct in some traits than in others? Does he tend to over-estimate or to under-estimate himself? Is this direction of error common to all traits, and fairly equal in amount, or does the constant error of self-estimation vary with the trait? By tabulating such results for all the individuals and taking averages of the tendencies, the general results for all the individuals of the group may be derived. How do these general results compare with those described in the text?

If intelligence was included among the traits judged, intelligence tests may be taken by all members of the group

and their scores recorded. All individuals may be ranked in order on the basis of these scores. How do the individual's judgments of himself accord with the results of the objective tests? How accurately do individuals estimate their own intelligence, as compared with other individuals known to them?

Carefully preserve all these records for use in a later experiment.

EXERCISE IV

THE PERSONAL INTERVIEW

Decide upon some appointment or position, familiar in its general character to all members of the class, for which candidates are to be interviewed. Such positions as the following may be suitable for college classes: editor of the college paper; student adviser to Freshmen entering the college; business manager of the athletic organization; delegate to an inter-collegiate conference on some contemporary question of college life; recipient of a prize to be awarded to the best all-round college student. Current affairs in the college will readily suggest some definite and interesting position of this general character.

Select from the Freshman class ten or twelve individuals who are not personally known to the members of the class and secure their consent to participate in the experiment. Each member of the class now constitutes himself an interviewer, and interviews each of the applicants in turn, observing the following conditions:

Separate booths or rooms should be available for each interviewer. If four minutes are allowed for each interview, the whole series can be conducted within one hour or one class period. At a signal each interview promptly terminates and the applicant passes to the next interviewer, and so on in turn, until he has visited each interviewer.

Each interviewer is allowed to conduct his interview in

whatever way seems best to him, but at the end of each interview he must record his impressions of the qualifications of the candidate in such a fashion that at the end of the hour he can assign to each candidate some score, or grade, or rank, which will make it possible to arrange all the applicants in an order of merit on the basis of his impressions. Care should be taken to avoid giving two candidates the same rank. If it seems desirable to the instructor, some definite system of grading or scoring may be agreed upon, and adopted by all interviewers.

The results from all interviewers may now be compiled in tabular form, and a study made of the agreements and disagreements. A final order may be derived, from the combined verdicts, and each interviewer's estimates may be compared with this final order. How closely do the interviewers agree? Are some interviewers more representative than others, that is, do their judgments accord more nearly with the final order?

Each interviewer, or particularly representative or non-representative interviewers, may now be called upon for an account of their interview method. Upon what criteria did they base their judgments? What influences determined their verdicts? What special difficulties were encountered in attempting to make such ratings of other individuals on the basis of brief interviews?

What indications are there that combining the verdicts of several interviewers gives more reliable results than those secured from single interviewers chosen at random? If some judges are more expert or representative than others, is there any way of finding out how they come to possess this expertness? What are the indications in the present instance?

Preserve all records for use in a later experiment.

EXERCISE V

RECOMMENDATIONS AND TESTIMONIALS

In Exercise III, which has already been performed and recorded, each individual estimated not only his own traits, but also judged the degree to which other persons of his acquaintance possessed these same traits. The data already accumulated in Exercise III may now be made the material for a study of the judgments of associates.

Each member of the class received a final rank, based on the combined judgments of all the members of the class. Taking each individual in turn, for a given trait, determine the mean deviation of the judges from this final rank. Do the judges differ more in estimating some individuals than in estimating others? Why? Determine the degree of deviation in this manner for all the traits. Averaging the mean deviations gives a measure of agreement of judges on each trait. Do the judges agree more closely in estimating some traits than in estimating others? How do these results compare with those given in Chapter VI? If a hierarchy of agreement is shown, how does this hierarchy compare with those suggested in Chapter VI?

Each individual should now classify all members of the class, except himself, on the basis of the degree of his acquaintance with them. Three degrees may conveniently be used, such as intimately acquainted, fairly well acquainted, only slightly acquainted. Consider now your own estimates of these individuals, and their degree of deviation from the final order assigned them. Does degree of acquaintance affect the accuracy of your judgments of your associates?

Each individual's judgments of the group may be correlated with the final order, thus giving a measure of his judicial capacity, or his representative character, or his agreement with the consensus of opinion. How do individuals differ in their "judicial capacity" as thus described? Does the individual whose verdicts are representative in one trait

also tend to show corresponding judicial capacity in other traits?

Individuals may now be ranked according to their "judicial capacity" in a given trait, and also according to their position in the final order for this trait. Is there any relation between possession of the trait in high degree and ability to judge that trait in others? How does this vary with the trait, and upon what factors do the results apparently depend?

Compare the abilities of all the individuals in (a) estimating their own traits; (b) estimating the traits of strangers in the interview; (c) estimating the traits of associates. Are the representative judges in the one case also representative in the other cases? What correlations are found? Is there such a thing as general judicial capacity in this connection?

Is there any relation between the ability to judge according to the consensus of opinion and the scores in the intelligence tests?

What further questions of interest might be raised and answered, for the circumstances in question, on the basis of the data now at hand?

EXERCISE VI

RATING SCALES

The following experiment illustrates the use of the "concrete specimen" rating scales, without introducing the factor of personalities. The same general principle may be utilized in judging people, and, at the discretion of the instructor, the method may be adapted to rating persons. Modifications of the method which involve the principles of the "graphic" rating scales may also be introduced if time allows.

Rating Works of Fiction.—Each individual suggests the qualities which a work of fiction, as a novel, should pos-

sess. Through discussion, several essential qualities are agreed upon. Several novels with which all the members of the class are acquainted are then chosen for rating.

Each individual rates each book, for each of the qualities, by what seems to him to be the best method—thus he may assign letter grades, per cent grades, descriptive terms, etc. The various ratings for a given trait are then compared, and the difficulties and ambiguities encountered by the use of such heterogeneous methods are exhibited. Attempts may be made to summate the grades assigned to a given book, in its various qualities, and the difficulties of such summation on the basis of these methods of grading will be revealed.

Each individual now prepares, for each trait, a concrete specimen scale, after the following manner: Suppose the quality is Realism, this being defined, by agreement, to mean "fidelity of detail to the real conditions of the epoch in which its scenes are laid." Select the most realistic novel of your acquaintance and call it A. Now select the least realistic novel of your acquaintance and call it E. Select some novel, C, which stands just half-way between A and E in this quality. Now select B which stands mid-way between A and C, and select D which stands mid-way between C and E. Write down the names of these novels, under the heading of the trait in question. Make similar scales for each of the qualities to be considered, writing out the names of the books under the appropriate quality headings. The same books need not of course appear in all the scales. Each scale is to be made up independently of the others, using for each quality, all the books you know, as possible choices.

Now turn to the books to be graded by all the members of the class. Taking each book in turn, locate it in the appropriate scale for each quality, as for example, "as good as C," "half-way between D and E," etc. It may be well to assign a value of 5, 4, 3, 2, 1 to A, B, C, D, E, respectively.

Consider now the gradings of a given book made by all the individual judges. Is agreement, consistency, or clear-

ness facilitated by the use of these concrete specimen scales? Secure the total value of each book, for your own rating, by summing the numerical values for all the qualities. How do these totals differ from individual to individual and from book to book? Distributing such scores in a surface of frequency, what distribution is observed?

If the various qualities are not equally important, how might you proceed to assign appropriate weights to the various qualities, so as to secure more accurate total scores or summation values for each book?

What special difficulties or possible sources of error arise in connection with the use of such rating scales? How eliminate them?

EXERCISE VII

GENERAL PRINCIPLES OF TESTS

The instructor may select, from the general equipment of the laboratory, a typical array of tests. Each test is administered to the class, and the method of scoring and evaluating the results is discussed. In this connection special attention may well be given, not so much to the results of the tests, but rather to the general principles of construction, expression, and standardization employed.

Faulty tests should be exhibited, which reveal defects in materials, in instruction, in technic, in scoring, in interpretation, etc. In this way the difference between a "test" and an "instrument of measurement" may be made clear.

In the case of each satisfactory test, consider first the method of construction—does it exemplify the standard task, homogeneous material, graded tasks, miscellaneous gradations, response values, or some combination of these, or some new principle, or some ambiguous principle?

Consider now the method in which the results of the test are expressed. Is the method that of original scores, percentile units, distribution units, developmental units, or abso-

lute units? Are any new or ambiguous principles revealed?

Students may be assigned the task of planning the development of a new test on one or more of the principles of construction. In such cases the steps necessary before the test assumes its final form may be outlined or described.

The following tests are suggested for use in this exercise. Only those are suggested which are likely to be easy of access or easily described, even if the materials are not available:

From Whipple, *Manual of Mental and Physical Tests*: Memory Span, Word Building, Ink Blot Test, Tapping Rate, Strength of Grip, Measures of Height and Weight, Cancellation (A Test).

From Pyle, *The Examination of School Children*: Logical Memory Test, Substitution Test (Symbol-Digit), Free Association, Part-Whole Test, Cancellation Test, various physical tests.

From Pintner and Paterson, *A Scale of Performance Tests*: Substitution Test, Healy A Test, Goddard Form Board, Ship Test, Knox Cube Test.

From other sources: The Binet Intelligence Scale (Terman, *The Measure of Intelligence*); Normative Summaries for Young Children (Gesell, *The Mental Growth of the Pre-School Child*); Community of Ideas (Rosanoff, *Manual of Psychiatry*, 6th Ed.); Thorndike's Drawing Scale and Scale for the Measurement of Handwriting; Trabue's Language Completion Scale; Various Trade Tests (Chapman, *Trade Tests*); Army Alpha Intelligence Scale; National Intelligence Test; Thorndike CAVD scale

EXERCISE VIII

MEASURING GENERAL COMPETENCE

A study of various tests or test series for the determination of "general intelligence" may be made at this point. For general class purposes it is more convenient to use tests that are suitable for group procedure. It should ordinarily

be made clear that such a demonstration as that here described does not constitute adequate training in the use of such tests, but represents merely a demonstration of some of the more commonly used forms, and a comparison of them.

After several forms of intelligence tests have been used with all the members of the class, the scores in each test may be computed, and comparisons made between the various sets of results. In this connection the possible results or influences of familiarity, practice, differences of age, education, previous occupation, etc., may be considered.

The Army Alpha Test will be one suitable form for adults. The scores achieved by members of the class may be distributed in a surface of frequency, and a study made of their range. In *Army Mental Tests*, by Yoakum and Yerkes (Henry Holt & Co.), may be found various tables of typical results, showing scores for various occupations, colleges, college classes, ages, races, and similar data. This book also contains instructions for giving and scoring the Alpha tests, and samples of the forms to be used.

The Otis Group Tests may also be used to advantage. Although they are in general not difficult enough to afford actual differentiation of college students, this fact in itself emphasizes certain important facts about intelligence tests and their use, the advantages and limitations of various forms, and other related points.

Several of the tests described in "The Mental Survey," by Pintner may be used to advantage, as special tests, each of which is separately standardized.

In "The Psychological Study of College Students" by Carothers (*Archives of Psychology*, Columbia University) are given standard instructions and norms on college freshmen in Barnard College. Some of these tests may be adapted to group procedure, but in general it will be better to leave these tests for a later experiment on psychographic methods.

If the instructor should desire to illustrate some method of individual examination, the Stanford Revision of the Binet-Simon Tests may be given by him to one or more

members of the class, after the manner of a demonstration. The scores of the individuals examined by this method may be compared with the scores received by the same individuals in the various group tests.

The various advantages and disadvantages of group tests as contrasted with individual examinations may be considered in detail. Special methods for the mental examination of the illiterate, the foreigner, the blind, and the deaf may also be considered and illustrated.

EXERCISE IX

MEASUREMENT OF SPECIAL APTITUDES

The measurement of special aptitudes, as distinguished from general competence or intelligence, may conveniently be illustrated by employing the following materials and methods.

1. *Measures of Musical Talent*.—The Seashore tests for musical abilities, including sense of pitch, sense of intensity, sense of time, sense of consonance, rhythm and tonal memory. These may be secured in the form of phonograph records from the Columbia Graphophone Company. A brief manual of instructions is also provided, which contains norms for adults and for eighth grade and fifth grade children.

2. *Mechanical Ability*.—The Stenquist Assembling Tests, which are furnished by C. H. Stoelting Company, Chicago, afford interesting measures of the ability to handle simple mechanical constructions. Manual of directions is issued along with the tests, and includes methods of scoring, norms, and other necessary information.

3. *Kelly Construction Test*.—This is furnished by Stoelting, along with directions. A set of stereoscopic slides, containing the scale for grading is also required.

4. *Motor Tests*.—Various tests of motor capacity, such

as steadiness, rate of tapping, coördination, and so on, are described in *Manual of Mental and Physical Tests*, by Whipple (Warwick and York). Useful tests to employ for this purpose are grip, tapping and coördination. Instruments required for these tests are furnished by Stoelting.

5. *Sensory Tests*.—Standard tests for visual acuity, auditory acuity, color discrimination, and similar abilities or processes are described in Whipple's *Manual*. Tests of visual acuity and of color discrimination may be readily used if the necessary materials or instruments are available.

To give all these tests to all the members of a class would require a very great deal of time. Selections should be made from the list or from other suitable materials, and typical illustrations given. It will be found instructive to compare by correlation or otherwise, the score attained in these special tests, with those made in the tests of general intelligence. The special tests may also be correlated with one another. In this manner the special character of these tests will be emphasized.

EXERCISE X

MEASURES OF KNOWLEDGE AND SKILL

The trade tests may be used to advantage in illustrating the method of the sample. Typical trade tests are given in *Trade Tests*, by J. C. Chapman (Henry Holt & Co.). These were developed by the Trade Test Division of the United States Army. Some of them relate to occupations which may be more or less familiar to some members of the class, and these occupations may be selected for the purpose of this exercise. In general the following tests will show some fairly high scores among most college classes. In giving the tests, follow closely the printed instructions for administration and scoring:

Oral Trade Tests	Picture Trade Tests	Performance Trade Tests
Tailor Butcher General carpenter Horseshoer Auto mechanic	General carpenter Cobbler Harness maker Horseshoer	These are not suited to general laboratory use, but may be described. The test for Typist may be tried out.

In considering the scores in these various trade tests, is there any correlation between the various tests? How are the facts to be explained? Are there correlations between scores in these trade tests and scores previously made in intelligence tests? How explain the facts?

Make a careful study, in Chapman's book, *Trade Tests*, of the procedures followed in developing and standardizing these trade tests. Now choose some occupation with which you are familiar and which finds many representatives in the territory in which you are living. Describe the way in which you would go about developing a picture trade test for this occupation. Outline the various steps in detail, indicating the probable difficulties you would encounter, and the manner in which these difficulties should be met.

Following the method described for the development of oral trade tests, undertake the collection of a set of questions for the occupation you have chosen to study. Carry out the steps of preliminary and final testing of the questions, calibrate the test, and assemble it in final form. Such occupations or trades as the following will provide interesting opportunity for such an exercise: cook, chamber-maid, elevator boy, janitor, laundress, nurse, teamster, barber, policeman, reporter.

From your study of the occupation you have chosen, what would seem to be the relative advantages and disadvantages of the three chief forms of trade tests—oral, picture and performance? Why?

EXERCISE XI

EDUCATIONAL MEASUREMENT

1. *Drawing*.—Each student makes as good a drawing as possible of either a church, a person or a snow-fight. Each then examines the drawings of all and assigns to each specimen, without consultation with others, a rating or grade in terms of general excellence. Compare the ratings given by different judges to the same picture. How do they agree, how intelligible, precise, and quantitatively comparable are they, how exact and definite as measures of drawing excellence?

Each student is now provided with a copy of Thorndike's Drawing Scale, and rates each specimen on this scale, following the standard instructions. Ratings on this basis are now compared. What are the advantages of such a Product Scale? How might this one be improved? To what practical uses might such a scale be put?

2. *Handwriting*.—Specimens of handwriting are provided, and these are graded first on the ordinary per cent method commonly used in grading school exercises. Some standard handwriting scale¹ is then used, and the specimens measured by the use of this scale. The advantages and practical uses of such a scale may then be considered, in the light of the experimental results.

3. *Reading*.—Copies of the Burgess Reading Scale or of the Thorndike-McCall Reading Scale are provided, and all the members of the class are put through the test for the measurement of ability in silent reading. What particular problems come up in connection with the use of such scales and the interpretation of results? A comparison of scores in these tests may be made with the scores in the intelligence tests previously accumulated. What relations are suggested?

¹The Thorndike Scale for the Measurement of Handwriting is a convenient one. To be secured from Teachers College, Bureau of Publications, Columbia University.

4. *Sewing*.—The Murdoch Sewing Scale² may be exhibited and its method of construction studied.

5. *Composition*.—The Hillegas Composition³ may also be studied to advantage, especially from the point of view of the principles involved in its construction. If time allows, each student may be asked to prepare a composition suitable for measurement on such a scale. These compositions may then be graded in the usual fashion and these grades compared with ratings made when the scale is used.

6. Consider the educational scales that have now been studied from the point of view of the principles of construction and the principles of expression described in the text. Which principles are illustrated in these educational scales? Are any new principles revealed?

EXERCISE XII

THE CORRELATION METHODS

In the first table are given data concerning eighteen sales-girls in a department store. For each are given the following: age, years of selling experience, weekly salary, average weekly bonus earned, education, manager's estimate of sales ability (excellent, good, fair, poor), salesmanship instructor's estimate of sales ability (rank in the group), instructor's estimate of intelligence (rank in the group). In some cases several individuals are given the same rating, indicating estimated equality. Sign + means somewhat better than the term assigned.

While these data leave much to be desired for the purpose of determining an objective criterion of sales ability, they

²K. Murdock, *A Scale for the Measurement of Hand Sewing*, Teachers College Contributions to Education. Monograph and Scale Plates required.

³M. H. Hillegas, *A Scale for the Measurement of English Compositions*, Teachers College, Bureau of Publications, Columbia University.

represent all the information available in the actual case. Suppose that it is desired to find tests that indicate sales ability, for the selection of new applicants. The first step will be to find tests that correlate well with such ability in the case of employees actually on the job. In order to correlate or otherwise compare test scores and sales ability, some more or less objective criterion of sales ability must first be secured. Use any of the data given, or all. Treat each item separately or combine some or all of them. It will be well to discuss the general problem first, and then for different members of the class to adopt different sorts of objective criteria. The results in the different cases may then be compared after the next step is completed.

In opposites, substitution, analogies, word reconstruction, and cube imitation the score is the amount of work or number of items accomplished under fixed conditions of time or trials. In color-naming the score is the time required for a fixed task.

SCORES OF SALESGIRLS IN SEVERAL TESTS

Name	Naming Opposites	Giving Anal- ogies	Word Recon- struction	Substi- tution	Color Naming	Cube Imitation
A	30	9	2	89	66.2	4
B	33	15	4	86	67.8	4
C	31	19	4	95	55.2	7
D	24	20	5	68	60.8	5
E	21	18	4	76	84.2	6
F	34	8	3	33	66.0	4
G	26	13	5	70	80.0	4
H	23	8	6	50	71.2	6
I	40	36	6	83	56.0	9
J	38	22	8	100	57.0	7
K	20	14	3	89	55.5	6
L	15	7	3	75	81.0	6
M	21	13	3	72	81.5	5
N	29	15	5	77	75.5	7
O	26	31	11	84	55.4	7
P	40	32	6	55	68.0	8
Q	12	6	1	77	71.8	5
R	21	10	3	60	57.5	6

DATA CONCERNING SALES GIRLS

Name	Age	Years of Selling	Weekly Salary	Average Weekly Bonus	Manager's Estimate	Instructor's Estimate		Education
						For Sales Ability	For Intel- ligence	
A	32	15	\$9.00	....	Fair	7	6	8th grade
B	26	8	10.00	\$2.00	Excellent	3	15.5	7th "
C	17	0.3	8.00	....	Excellent	3	15.5	7th "
D	20	2	8.50	.75	Good	12	10	8th "
E	21	0.5	8.00	.75	Poor +	12	8	8th "
F	29	11	13.00	3.00	Good	11.5	15.5	7th "
G	19	1	7.00	1.00	Good +	3	12	8th "
H	24	2	10.00	.75	Good	12	11	8th "
I	18	0.5	8.00	....	Fair	7	4	7th "
J	18	2	9.00	.50	Good	12	9	7th "
K	21	4	9.00	....	Good	17	15.5	7th "
L	21	4.5	9.00	....	Good	18	18	6th "
M	23	5.5	10.00	3.00	Excellent	7	7	8th "
N	23	5	10.00	.50	Fair	12	4	8th "
O	49	5	10.00	....	Good	3	1.5	2nd h. school
P	25	0.3	12.00	....	Excellent	3	1.5	3rd college
Q	18	2	7.00	....	Excellent	16	13	7th grade
R	32	10	9.00	....	Fair	12	15.5	8th "

In the preceding table are given the results when several tests were applied to these individuals. In each case the individuals are given their scores in each test. By comparing these test results with the chosen criterion derived from the foregoing table, select a team of tests that seem to indicate best of all the relative sales ability of these individuals. With the advice of the instructor, various methods of comparison may be employed.

Do you find that some of these tests are better indicators of sales ability than are others? How would you select the best team of three tests? Would you give each of these three equal value in computing the total score of an individual? If not, how would you weigh the various tests?

Look up in books on statistical methods the methods for partial and multiple correlation and indicate the way in which these methods might be put to significant use in such an investigation as this.

What seem to you, from your experience with these results, to be some of the principal difficulties encountered in the application of the correlation methods to problems of employment and placement?¹

EXERCISE XIII

TEMPERAMENTAL CHARACTERISTICS

The following experiments, selected from the many available ones, may readily be planned for group or individual experiments. The results in each case may be compared with the results of preceding tests and exercises, as with self-estimates, judgments of associates, intelligence tests, tests of

¹ The data used in this exercise were secured in a study conducted by Elsie Oschrein Bregman. After completing the exercises it will be interesting to read "Vocational Tests for Retail Saleswomen," by Elsie Oschrein, *Journal of Applied Psychology*, June, 1918. For further examples consult various other references given in the Bibliography preceding this Appendix.

special aptitudes, and so on. In general the plan will be to become familiar with the proposed method by actual use of it, and to discuss its merits and shortcomings.

1. *Downey Will Profile*.—For the determination and measurement of the volitional pattern. Necessary blanks, instructions, materials and norms, either for the individual form or for the group form of this test, are to be secured from the World Book Company, Yonkers, New York.

2. *Moore Aggressiveness Test*.—A description of the methods and results of this series of tests is to be found in "The Measurement of Aggressiveness," by H. C. Moore, *Journal of Applied Psychology*, June, 1921.

3. *Kent-Rosanoff Association Test*.—Instructions and lists of stimulus words, with table of results are to be found in "A Study of Association in Insanity," by Kent and Rosanoff, *American Journal of Insanity*, Numbers 1 and 2, 1910. The method is also described in Whipple's *Manual of Mental and Physical Tests*, Vol. 2, Test 33A, page 53, with a full discussion of the results secured by this method under various circumstances.

4. *Suggestibility Tests*.—In Chapter X of Whipple's *Manual of Mental and Physical Tests*, five tests are described and discussed in detail. The materials needed for these tests are furnished by C. H. Stoelting Company, 3037 Carroll Avenue, Chicago. See also "Individual and Sex Differences in Suggestibility," by Warner Brown, *University of California Publications in Psychology*, Vol. II, No. 6, July, 1916, and "A Study of Suggestibility in Children," by Margaret Otis, *Archives of Psychology*, Columbia University, No. 70, 1924.

5. *Tests of Mental Balance*.—Consult Chapter VII of Wells, *Mental Adjustments* (D. Appleton & Co. 1917), for accounts of various methods of attempting to measure mental balance and moral perception. Fernald's test, or some adaptation of the original experiments reported by Wells, may be used as a class exercise.

EXERCISE XIV

PSYCHOGRAPHIC METHODS

1. In the foregoing exercises many measurements of each member of the class have been secured. Some of these are not directly comparable with the others, but several of them can be brought together for purposes of psychographic presentation and analysis. Thus the intelligence tests, the test of musical ability, of mechanical ability, the motor and sensory tests, the will profile, the association test and some of the suggestibility tests, all afford records which can be expressed in approximately comparable form. Select some form of expression, as mental age, percentile, or distribution units, and express your own records in each test in this form.

Now construct a psychographic chart similar to those illustrated in the text, and record thereon your own standing in each of the tests you have selected. This will give a partial profile or psychographic record of your abilities and characteristics. What in general does the chart tell you about your mental equipment as shown by the tests? Compare your own profile with those of other members of the class. Discuss the differences and resemblances found. To what practical use might such data be put? To what extent do they represent a complete analysis of your personality?

2. Some of the general test systems, as the Alpha test for example, consist of several different tests which may be independently scored and which seem to involve somewhat different types of work. The total score in such a test system may be analyzed into its component scores, and these partial scores may be represented in psychographic form. The article by Yerkes and Cobb, given in the Bibliography, may be consulted in this connection as an interesting illustration of the method.

3. In Carothers, *Psychological Study of College Students*,¹

¹ *Archives of Psychology*. Columbia University publishes this monograph, and the test materials may be secured from C. H. Stoelting Company, Chicago.

will be found an array of tests described, from the Woodworth-Wells series. Instructions for giving, scoring, and evaluating each test are given, and norms on college students are also presented. Each member of the class may be given this array of tests and a psychographic record and analysis made of the results. Test blanks for this series may be secured from Stoelting.

EXERCISE XV

EXAMINATION OF AN INDIVIDUAL

A stranger, either child or adult, may be brought before the class for examination, and a very elaborate experiment planned. This experiment may of course be abbreviated according to the time available.¹

1. On the basis of the appearance and manner of the subject, each student records his impression of the individual's intelligence, and of such other traits as may be agreed upon. These records may later be compared with one another and with the results of the examination.

2. Each student may be allowed to interview the subject, briefly, and record his estimates of the individual's characteristics on the basis of this interview.

3. Selected intelligence tests may be given the subject, in the presence of the class, preferably an array of tests each of which can be independently scored and recorded. One of the miscellaneous scales, as the Stanford-Revision, may also be used for a summary intelligence score.

4. Tests of special aptitudes, such as the musical talent tests, the Stenquist Construction Test, and some of the motor and sensory tests should also be employed.

5. Educational tests, for which there are norms which

¹ Unless the instructor is prepared to conduct such an individual examination and to select the tests used, according to purpose and availability, this exercise should not be attempted.

make the results comparable with the other measurements, may also be used if time permits or if the subject can appear on several occasions.

6. Selected temperamental tests, as for example the will profile,² the Kent-Rosanoff³ and some of the suggestibility⁴ tests may also be given with profit.

On the basis of these results, each student, or the class in joint enterprise, now prepares a psychographic record of the results of the complete examination. Discussion may center about the significance of such an intensive study of the individual, and the practical uses to which the results may be put.

This experiment requires, in the full form here described, a great deal of time, care, patience, and expertness. If only one afternoon or forenoon is available, the experiment should be abbreviated in such a fashion that whatever measurements are made may be made under favorable conditions and may conform to the most rigorous standards of technic.

EXERCISE XVI

INSTALLATION OF EMPLOYMENT SUPERVISOR

Assume that you either own or have direct charge of a business which has grown to such proportions that it seems desirable to establish, at least in a preliminary way, a special department of personnel direction. In your capacity as owner or director you have just employed a college graduate of high general intelligence, a general familiarity with your line of business, and a personal interest in people. He is to take charge of the employment and placement of all the factory operatives or of all the clerical personnel.

1. What directions would you give him in connection with

² J. E. Downey, *The Will Profile*.

³ A. J. Rosanoff, *Manual of Psychiatry*, 6th ed. See the Appendix.

⁴ Margaret Otis, "Suggestibility in Children," *Archives of Psychology*, Columbia University.

the use of letters of application and the development of application forms, so that these materials should afford him the greatest amount of reliable data, for his guidance?

2. What practice or training would you prescribe in order to ensure the correspondence of his judgments with what experience has shown you to be the best general policy in the selection of individuals and their placement in the organization?

3. What devices and methods would you recommend to him, in order to help him get the maximum amount of reliable information from letters of reference and testimonials?

4. What general principles, useful suggestions, and particular cautions would you give him in order to improve his interviewing of foremen and supervisors regarding job requirements?

5. What helpful suggestions would you give him in order to increase the accuracy and effectiveness of his personal interviews with candidates for employment?

6. What special sources of error should he learn to take into account in evaluating the testimony of others or in rendering judgments of his own, concerning the characteristics of other people?

7. If the workers whom he is to select and place should have fairly definite degrees of general intelligence, what group tests might he well undertake to have in readiness for the examination of applicants in this respect?

8. How in general should he proceed to select special tests which would make it possible to determine whether a given applicant should, for most efficient and satisfying work, be assigned to the group of clerical workers or to the group of factory operatives.

9. If it should seem best for him to pursue a special course of instruction or training in vocational and industrial psychology or in personnel methods and human engineering, through home study, prescribe for him a series of books dealing in a valuable way with such topics as statistical methods, employment practice, vocational psychology, character study, mental measurement, social psychology, industrial

management, job analysis, labor problems, wage adjustments, office management, business organization. If you are not familiar with these fields consult a reference librarian or specialists in the various fields.

APPENDIX B

BIBLIOGRAPHY

References are here given to typical books and articles in English relating to the chief topics of the present volume. The bibliography is by no means complete and is intended merely to direct the reader who desires a closer acquaintance with the details of any of the special topics around which the volume is organized.

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